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A
T R E A T I S E
O N
M I N E R A L W A T E R S.

THE END OF THE WORLD

THE END OF THE WORLD

T R E A T

O N



MINERAL WATERS.

IN TWO VOLUMES.

BY DONALD MONRO, M. D.

PHYSICIAN TO HIS MAJESTY'S ARMY AND
TO ST. GEORGE'S HOSPITAL, F. R. S.

V O L. I.

L O N D O N:

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MDCCLXX.

Handwritten text at the top of the page, possibly a title or header, which is mostly illegible due to fading and bleed-through.

Main body of handwritten text, appearing to be a letter or a detailed account. The text is written in cursive and is significantly faded, with many words being illegible. It seems to contain several paragraphs of text.



P R E F A C E

MINERAL Waters have been long held in great esteem for the cure of many disorders incident to the human body; and therefore Physicians have, in all ages, been desirous of discovering their true contents, in order more precisely to determine their peculiar virtues and properties.

But as in former times chemistry was scarce known, or cultivated as a science, they had no other way of judging of their various impregnations and different qualities, but by the taste and smell, and the sensible effects they produced on the human body; which being insufficient to determine any thing certain, they were left at liberty to suppose them impregnated, with whatever their imaginations led them

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to believe, or their interest suggested; and hence it is, that gold, silver, and many other bodies, which the more accurate examination of later times has determined not to be soluble in water, by means of any menstruum hitherto found native in the earth, have a place in the long catalogue of substances said to be contained in mineral waters.

In the sixteenth century physicians began to evaporate them, and to try other experiments to discover their qualities, and to procure the solid bodies they contained; but the progress of their researches was very slow, till, in the last century, societies for the advancement of natural knowledge were established at London, and at Paris, and in other parts of Europe; whose members applying themselves to this study discovered new methods, and added great improvements to those already known for the examination of mineral

mineral waters ; and from time to time published histories of the analysis, and virtues of particular waters in the works of these societies, or in separate tracts, which encouraged others to follow their example ; so that we have now tolerable accurate accounts, of many of the most remarkable mineral waters of Europe, as well as superficial ones of others in different quarters of the world.

From such of these accounts as the author could meet with, the following work was originally compiled, as part of a course of lectures on the *materia medica*, and the theory and practice of physic read in the years 1758, 1759, and 1760 ; but which was interrupted by his being appointed one of the physicians to his majesty's army then in Germany. Since his return from that duty he has frequently revised it, and added such observations as have occasionally occurred to him, or which have been published since that time.

In the first part of this work he treats on the general properties of *water*, considered as perfectly pure and unadulterated in the strictest sense; then on rain and snow water, which are commonly reckoned to be naturally more pure than any other; afterwards on the various substances with which they may be impregnated in the bowels of the earth, and the proper methods by which these substances are to be discovered.

In the second part he has treated of *cold*, and in the third of *hot waters*, dividing each kind into such classes as appeared most likely to give a clear and distinct idea of their nature, and properties; and in considering each class he has first given the general characteristics, and virtues of the waters belonging to it; and then added the most accurate analysis he could find of each particular water, marking any differences which authors have observed in per-

performing their experiments, and any particular virtues which have been ascribed to each water, more than what seemed to belong to the class in general ; but in doing this he has been careful not to run into that long enumeration of virtues which credulous admirers, or interested practitioners, have attributed to every mineral spring they describe.

The histories of the particular mineral waters, in the following work, are taken from the accounts of others, which are constantly cited in order that every reader may judge for himself of the credit of the authority, without the addition of any complete analysis by the author ; for ever since he considered this subject attentively, the care of large hospitals, and the ordinary course of his profession, have prevented his having time to do more, than to try some of the common experiments with the recent waters of those springs he

X P R E F A C E.

has visited ; and besides taking notice of those mineral waters which have been particularly described, he has endeavoured to point out the particular situation and general properties of many others, which have been but cursorily mentioned by authors ; in order to engage those physicians, or lovers of natural knowledge, who may happen to visit the places where their springs are situated, to examine them with care, and ascertain their peculiar qualities ; which would be a very valuable addition to this curious and useful part of natural history, and of medicine.

It is necessary here to observe, that it is not always easy, from the accounts given by authors, to ascertain the exact proportions of the different solid matters got by a chymical analysis from mineral waters ; for the weights and measures of the same name are different in different countries, nay often in the same country ; thus the English
wine

wine *gallon* measure contains two hundred and twenty-four cubical inches; the English ale *gallon* two hundred and eighty-two; and the Irish wine and ale *gallon*, which Dr. Ruttty made use of, only two hundred and seventeen three-fifths.

The English *medical pound* * of liquors contains sixteen ounces, the foreign, for the most part, only twelve.

The English, French, and Scotch pints differ greatly from one another, as do the number of ounces and grains in the pound weight of different countries.

These circumstances ought therefore to be carefully attended to, in considering this subject.

Monsieur Du Clos, and some few others, seem to have followed the best method of communicating the exact quantity of solid contents they found

* The English pint of liquors weighs exactly a pound or sixteen ounces; and hence in speaking of them we use the words *Pound* and *Pint* indifferently, which other nations do not.

in the waters they examined, by telling us the proportion they bore to the whole body of the water; for example, that they were one hundredth or one thousandth part of the whole; and it is to be wished, that those who hereafter make experiments of this kind, would follow their example.

Wherever writers on this subject have said, that one, two, or three pounds of any water yielded so much solid contents, and it is then added in the following work, “that this is in the proportion of so much from the gallon,” it is to be understood, that the gallon contains eight of the pounds mentioned by the original author; but if it is said, “that the solid contents were one hundredth or one thousandth part of the whole, and it is afterwards added, that this is in the proportion of so much from the gallon,” the author then means, that the gallon contains eight pounds of sixteen ounces each, and that each ounce weighs four hundred and eighty grains.



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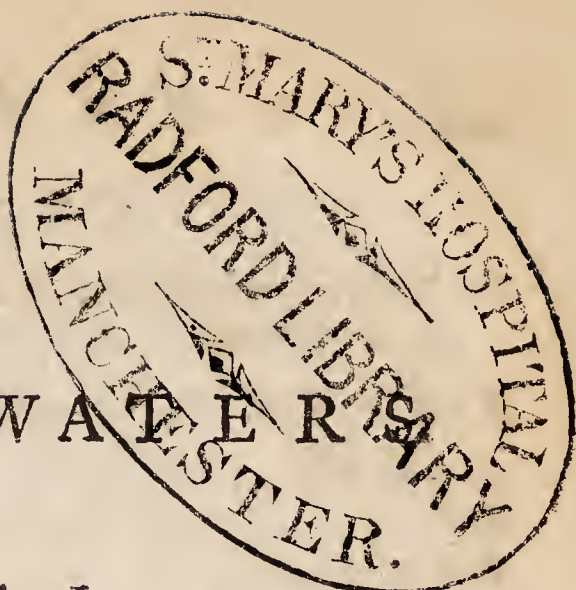
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ERRATA CORRIGENDA.

Page 14, line 23, for *acids* read *acid*. P. 17, l. 17 of note, for *it had* read *they had*. P. 26, l. 19, for *in it* read *in them*. P. 33, l. 5, for *which does not* read *which, after being sufficiently diluted, does not*. P. 35, l. 16, for *be a species of true sulphur* read *be what he alledges*. P. 42, l. 26, for *and which* read *which*. P. 47, l. 4, dele *3dly*. *ibid.* l. 11, for *4thly* read *3dly*. P. 48, l. 1, for *5thly* read *4thly*.

O F
MINERAL WATER
PART I.



CHAP. I.
OF WATER.

WATER is that colourless, transparent, unflammable fluid, so universally diffused over the face of the earth, and so common, that every body has a clear idea of it on hearing its name.

It is in so constant use not only for our drink, but also in preparing all our solid food, that it may be justly said to be the vehicle of all our nourishment; for it is not only mixed with it, in the first passages, but it is in this vehicle that it is taken up into the lacteal and lymphatic veins, and

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from

from thence carried through every vessel of the body.

It gives fluidity and mildness to the blood; and is the best menstruum for dissolving saline, putrescent particles, and carrying them out of the body, by the different secretory and excretory organs; and by these means proves the most universal remedy in nature, and useful in every disorder.

Hitherto we have not been able to find any water perfectly pure, or free from all heterogeneous mixture; for whether it passes through the air, or the bowels of the earth, it meets with numerous foreign bodies, which mix intimately and incorporate with it. However, in common, we call that water pure or sweet, which is clear and colourless, and has no sensible taste or smell.

Waters are commonly divided into two sorts:

1st. The meteoric, or that which falls on the earth in form of dew, rain, hail, or snow.

2dly. The terrestrial, or that which runs on the surface of the earth, or passes through its substance.

1st. The

1st. The meteoric water is made up of the humid vapours, or exhalations raised from the earth, and condensed by cold into their pristine form. This is the sweetest and purest water nature affords, but is not exempted from heterogeneous mixture; for we find it variously impregnated with whatever is found capable of floating in the atmosphere, with the small seeds of various plants, with the eggs of insects, and with the fine particles of earth, and of other substances that are perpetually flying about in the air. Hence it is, that the purest rain-water constantly ferments and putrefies, after long standing, especially in a warm place; and if it be then distilled, it yields an oily, and, in some measure, an inflammable spirit; and all water, that has been hitherto discovered, has been found upon trial to contain more or less of a fine earth and an oily matter ^a.

Mr.

^aDr. *Stahl* observes, that rain, snow, and dew, by digestion and putrefaction, not only manifest this terrestrial but also an oily substance; and he says, no less remarkable is the spirit of spring water, taken up near the spring head, and that of new fallen rain and dew, vide *Fundam. Chymicæ* 1723, p. 120. § 4; and in another place he takes notice

Mr. *Marggraf* ^b, in order to find out the contents of meteoric waters, performed the following experiments.

He collected a hundred quarts of rain water, and an equal quantity of snow water; each quart containing thirty-six ounces.

He put three quarts of the rain water into a retort, capable of containing twelve; and distilled with a heat less than that of boiling water, gradually adding more as the distillation went on. The water came over in drops, and at the end of many days, there remained only three quarts of the hundred, which were muddy, and gave evident marks of an earthy mixture; by evaporating this remainder to six or eight ounces, and filtrating it, he got about a hundred grains (or one drachm and two scruples) of a fine white calcarious earth. As he suspected an acid to be contained in the filtrated liquor, he

that credible authors have affirmed, that simple water, by repeated distillations, becomes so subtle and volatile as to pass through glass, *ibid.* p. 38. § 7. and *Grewsius*, he says, asserts, that by bare distilling of rain water, it may be preserved for ages uncorrupted; but if the operation be performed with violence the water will not keep good for a year, *ibid.* p. 47. § 20.

^b *Memoir. de l'Academ. de Berlin pour l'année 1751, publié en 1753, p. 131.*

added

added thirty drops of a solution of very pure salt of tartar in distilled water, and got first a small quantity of a salt resembling nitre ^c, and then some cubic chrystals of sea salt; both which were brown, and shewed a mixture of an oily matter.

The snow water, treated in the same manner, yielded sixty grains of a calcarious earth; and upon the addition of an alkaline salt afforded more sea salt than nitre.

2d. The terrestrial waters are those found either on the surface, or in the bowels of the earth; they are always more gross and impure than the meteoric, and are commonly divided into the simple and mineral; those being called *simple*, which have no sensible taste or smell; and those *mineral*, which are remarkably impregnated with some mineral substance.

The simple are commonly divided into —1. *Spring*.—2. *Well*.—3. *River*.—4. *Lake*.—And 5. *Stagnant water*, which are reckoned more or less pure, in the order we have ranked them; though there is a great va-

^c Dr. Ratty in his *Experiments* got a calcarious glauber and sea salt by evaporating rain water. See his *Methodical Synopsis*, book I. chap. v. p. 35, &c.

riety in each class, and we find almost each particular water impregnated with different substances; nor can we almost by any art free even the purest water from all heterogeneous mixture; for Mr. *Boyle* ^d affirms, that rain water, distilled near two hundred times, always left a white insipid earthy sediment: however water may be obtained sufficiently pure for making most experiments, and for the greater number of the purposes of life, by distilling it two or three times with care.

The purest spring waters were said by *Triumphus* to contain about two grains of solid matter in the pint; but Dr. *Hales* found, that a water at Hampton Court contained only one grain and a half, and Dr. *Wall* of Worcester, that three quarts of the Holy Well water at Malvern, evaporated in an open silver vessel, left no residuum that could be collected; and Dr. *Rutty* ^e, that “ some waters in Dublin

^d See his account of forms and qualities — Dr. *Hoffman* thinks, that this earthy or saline matter is rather an accidental than a real constituent part of water; though, in effect, he says there is no water to be found that does not contain some portion of dry or solid matter; for if the finest and purest water be ever so often distilled, it still leaves some small quantity of a dry solid matter behind. *De Aqua*, § 1. N^o 6.

^e See his Method, Synopsis, book 1.

“ contained

“ contained only one grain, (which is less
“ than rain water yields) and were as
“ light as distilled. — And in treating of
“ hard and soft waters, he observes ^f, that
“ such as contained about ten grains to a pint
“ commenced to be laxative in operation,
“ from the impregnating salt; so that the pro-
“ portion of about ten grains of salino-ter-
“ restrial matter, to a pint, seems to be nearly
“ the least that properly intitles a water to
“ the denomination of hard; and thus the
“ limits between hard and soft waters are
“ very nearly adjusted.”

The purer water is, the lighter it is, and the more apt to congeal or freeze; the sooner it is heated and the sooner it is cooled; the greater noise it makes when poured from one vessel to another; the sooner and more it wets, and the softer it feels to the touch.

When water is perfectly pure, a solution of soap in spirits of wine, dropt into it, mixes smoothly, and easily with it; as does a solution of gold in aqua regia, or of silver or mercury in spirit of nitre; or of lead in vinegar, without causing the least turbidness or precipitation; whereas if the water be impreg-

^f Ibid.

nated with an earth or metal, by means of an acid, as is the case with most hard waters, the soap is immediately decomposed and curdles; or the metallic solution becomes turbid, and a precipitation ensues.

Hard waters, or those impregnated with an earthy, or metallic matter, by means of an acid, may often be made soft by mere boiling, or by exposing them for some time to the heat of the sun; for by such treatment, when their acid is in a volatile state, it flies off, and the earthy or metallic particles fall to the bottom; and all hard waters may be made soft, or capable of lathering with soap, by adding so much of a pure alkaline salt, as is sufficient to precipitate their earthy or metallic matter, and to fully saturate their acid.

All hard waters are heavy in proportion to the quantity of acid and mineral solid matter they contain; excepting such, as at the same time are so impregnated with air, or mineral spirit, as to counterbalance the effect of these substances; they are heated with difficulty, but retain that heat long; and they do not easily freeze; and hence
in

in this country some of them are feldom or never covered with ice.

Pure water is a liquor that remains always fluid while its heat is fo great as to raife Fahrenheit's thermometer to thirty-three degrees, but affumes a folid form, or freezes, and becomes ice as foon as the thermometer falls to thirty-two in the open air.

The weight of water, to that of air, is commonly reckoned as 850 to 1, and to that of gold as 1,000 to 19,640.

It is a fluid, quite incompressible by any means hitherto known. It has been put into hollow spheres made of different metals, and they have been beat with hammers, but the water always transfused through the pores of the metal, as foon as the figures of the spheres were in any ways altered.

By heat it evaporates in the form of a fine vapour, and by cold it is condensed into ice: it is capable of great rarefaction and extreme expansion; and its rarified and confined vapour is capable of diffolving the hardest parts of vegetables and of animals; as we know by experiments made with Papin's digester.

The

The mixture of some saline bodies is found to increase immediately the heat of water, while the mixture of others increases its cold; but after some time the water returns to the temperature of the atmosphere g.

Water

§ The heat or cold generated by the mixture of saline bodies only lasts till they be intimately united, when immediately the liquor returns to the temperature of the atmosphere.

The following salts generate heat by being mixed with water, and raise the thermometer.

Boerhaave, in his *Element. Chym.* vol. I. p. 377. tells us, that three ounces of water mixed with one ounce of oil vitriol raised *Fahrenheit's* therm. from 45 degrees to 60.

And p. 374. that one ounce of dry salt of tartar, with three ounces of water, raised it from 47 to 57.

Mr. *Eller*, in the Memoirs of the academy of Berlin for 1750, published in 1752, p. 83. says, that the following salts mixed with distilled water raised Reaumur's thermometer as follows:

				FAHRENHEIT'S
Fixed alkaline salts raised it —	4	degrees, or	9	
Glauber salt —————	4	—————	9	
Sedlitz salt —————	3	—————	$6\frac{3}{4}$	
White vitriol —————	7	—————	$15\frac{6}{8}$	
Vitriol dried to whiteness —	16	—————	36	

Boerhaave tells us, that the following salts generate cold in the time of their solution in water.

One ounce of nitre with three ounces of water lowered *Fahrenheit's* thermometer from ——— 47 to 36 degrees.

One ounce of borax with three ounces of water from ————— 48 to $45\frac{1}{2}$

One

Water has the following properties with respect to other bodies.

1st. It is the proper solvent of all saline bodies, acid, alkaline, and neutral.—It dissolves only a certain quantity of each salt; but after it is fully saturated with one sort, it is still capable of dissolving a certain

One ounce of sea salt with three ounces of water from ——— — 46 to 43 degrees.

One ounce of sal. ammon with three ounces of water from ——— — 47 to 28

Mr. *Eller*, in the Memoirs of the Berlin academy, has given the following table of salts, which lowered *Reaumur's* thermometer in the time of their solution.

				FAHRENHEIT'S	
Volatile salt of urine lowered it	2	degrees, or	$4\frac{1}{2}$		
Vol. salt of hartshorn	6		$13\frac{1}{2}$		
Tartarus vitriolatus	3		$6\frac{3}{4}$		
Sal polychrest.	2		$4\frac{1}{2}$		
Refined nitre	8		18		
Sea salt	2		$4\frac{1}{2}$		
Sal de Seignette	7		$15\frac{6}{8}$		
Epsom salt	2		$4\frac{1}{2}$		
Sal ammoniac	12		27		
Alum	$2\frac{1}{2}$		$5\frac{5}{8}$		
Green vitriol	$1\frac{1}{2}$		$3\frac{3}{8}$		
Blue vitriol	$3\frac{1}{2}$		$7\frac{7}{8}$		

The freezing point or 32 of *Fahrenheit's* thermometer is 0 in *Reaumur's*; the degrees begin from hence, and every degree, in *Reaumur's* is equal to two degrees and $\frac{1}{4}$ in *Fahrenheit's*; for the heat of boiling water raises the quicksilver of this thermometer to 80, and the heat of the blood to $28\frac{4}{9}$.

quantity of another ^h; and when heated it dissolves and keeps suspended a greater quantity of salts than when it is cold.

2dly. It mixes readily with ardent spirits, but not with sulphur or any sort of oil, without the addition of some saline body; or that these substances be deprived of air by being mixed with quicklime, or by some
other

^h Mr. Eller, in the *Memoirs of the academy of Berlin* for 1750, published in 1752, has given several experiments of this kind; he found that eight ounces of distilled water saturated

With four ounces of nitre, was capable of dissolving one ounce, five drachms of fixed alkaline salt, and half an ounce of common salt.

With three ounces, one drachm, one scruple of common salt dissolved three drachms of nitre and five drachms of fixed alkaline salt.

With three ounces and a half of fossil salt dissolved half an ounce of nitre.

With half an ounce of cream of tartar dissolved half an ounce of Sedlitz salt and as much fixed alkali.

With an ounce and a half of tartar. vitriolat. dissolved half an ounce of fixed alkaline salt.

With three ounces and a half of Glauber salt dissolved two drachms of nitre and as much sugar.

With four ounces of soluble tartar dissolved half an ounce of refined nitre.

With four ounces of Epsom salt dissolved half an ounce of refined sugar.

With

other means; indeed in the distillation of aromatic plants with water, a small portion of essential oils seems to mix with it, and to communicate their flavour and somewhat of their taste; but this is owing to the fine spiritus rector and part of the acid, and probably likewise to part of the mucilaginous particles of the original substance uniting with the water, and coming over with it in the distillation; but by length of time a great

With five ounces and a half of Sedlitz salt dissolved half an ounce of sugar and as much fixed alkali.

With two ounces and a half of sal ammoniac dissolved five drachms of fossil salt.

With an ounce and a half of sal vol. c. cervi dissolved one ounce of nitre and half an ounce of sugar.

With four drachms two scruples of borax dissolved half an ounce of fixed alkaline salt.

With two ounces and a half of alum dissolved six drachms of common salt, and one drachm of Epsom salt.

With nine ounces and a half of green vitriol dissolved an ounce and a half of Sedlitz salt, two drachms of nitre, and three ounces of refined sugar.

With nine ounces of blue vitriol dissolved an ounce of nitre, three drachms of common salt, and an ounce of sugar.

With three ounces and a half of vitriol dried to whiteness dissolved two ounces and a half of common salt, and half a drachm of nitre.

With four ounces and a half of white vitriol dissolved one ounce of refined sugar.

part

part of this oil separates from the water, and swims a top of it.

It mixes with and dissolves all soaps, both acid and alkaline, and it readily mixes with mucilages and gums; and by their means may be made into a kind of emulsion with oils.

3dly. It has no effect in dissolving any pure metal or metallic substance, except *arsenic*, unless it be impregnated with an acid, alkaline, or neutral salt, when it becomes a menstruum for any metallic substance which these salts were capable of dissolving.

4thly. It has no effect in dissolving any earths, except some of the calcarious kind, when reduced to the state of a calx or quicklime, or that they be saturated with too large a proportion of air; though the lighter kinds are often suspended in it; but when mixed with an acid, it is then capable of dissolving all earthy substances, to which such acids served as a menstruum.

The purer water is, the more proper it is for the common uses of life, and the more it is esteemed useful for the preservation of health;

health; and many of the purer sort of spring waters found in Great Britain, and other countries, have been noted for the cure of many internal chronic diseases, and of sore eyes, old ulcers, and other external disorders.

C H A P. II.

OF THE DIFFERENT SUB-
STANCES WITH WHICH
MINERAL WATERS MAY
BE IMPREGNATED.

WE already observed that many waters were impregnated with mineral bodies which gave them a taste, smell, and other properties, different from those of simple water, and which from thence have been called *Mineral*. As such waters are impregnated by those substances in their passage through the earth, we may lay it down as a certain rule, that fossil matters only can enter into the composition of mineral waters, and only such of them as are soluble
in

in water, or soluble in it when joined to some saline body, either acid, alkaline, or neutral; or when it meets with bodies which are either deprived of air, or saturated with too large a quantity of it.

I. Saline substances, acid, alkaline, and neutral are soluble in, and easily miscible with water; and therefore waters are found impregnated with such of them as are native in the earth.

The greater number of mineral waters hitherto discovered contain the *vitriolic acid*, which has very seldom been found single in any water, but almost always combined with some alkaline, metallic, or earthy matter which it has met with in its passage through the earth; tho' some waters near to Mount *Ætna* in Sicily and others in Italyⁱ,
and

ⁱ *Varenius*, in his *System of General Geography* (sect. iv. chap. 17. prop. vi. vol. I. p. 370.) mentions the water of a fountain in the province of *Nota* in Sicily, which he says men use instead of vinegar: and *Monf. Colonne* in his *Hist. Natur. de l'Univers*, tells us, that there are warm acid waters in the neighbourhood of Mount *Ætna*. If these facts be true, it is probable that the subterraneous fire, in decomposing the sulphureous mineral bodies by which it is principally fed, disengages a large portion of the vitriolic acid in the neighbourhood of these fountains.

and some which run thorough caverns, have been said to be sour, and to give other strong marks of an acid; and others, such as those of Passy and Spaw^f, have been alledged to have an acid prevalent in them, as taken up immediately from the fountain.

This acid, in some waters, seems to be of the fixed kind, but for the most part we find it to be in a volatile state^g, and hence

it

—— And this is confirmed by Dr. *Dominicus Vandellius*, in his treatise *De thermis agri Patavini*, p. 95. (^h) for he says, if any one was to see the native vitriolic acid falling by drops in a cavern near the town of Latera, which is about eight miles from the aquæ taurinæ, he would say it came from subterraneous fire decomposing and distilling mines of vitriol or of the pyrites stone: and he mentions another acid water that is got near the town of Selvena, about forty-six miles from Siena.

^f See Dr. *Lucas's* account of these waters in his *Essay on Waters*, vol. II. p. 147, &c.

^g Mr. *Lemery*, in the *Memoirs of the French Academy of Sciences*, 1701, edit. 8vo. hist. p. 78. tells us, that the waters of Passy, near to Paris, when taken up immediately from the fountain turned the blue colour of the juice of the tournsol red, but after a very little time it had no such effect.——And Messrs. *Regis* and *Dedier*, in the same *Memoirs* for the year 1699, say, that the waters of Balaruc struck somewhat of a red colour, with a tincture of the blue flowers of the marshmallows, when taken up from the fountain, which they did not after they

it soon evaporates or flies off; and it raises an effervescence, and is dislodged by the addition of any of the common mineral, or even of the vegetable acids; and hence we ought not immediately to conclude, that a

had stood till they were cold. And *De Clos*, that the water of St. Mion, in the Auvergne, made the juice of the tournsol a little red, even after it was brought to Paris, and likewise the first of the water that was brought over by distillation from it.—*Dr. Lucas*, in his *Essay on Waters*, part 2. p. 14. § 42. and p. 152. § 97. and p. 202. § 275. affirms, that a tea-spoonful of syrup of violets mixed with two ounces of Spa water, as taken immediately from the fountain, gives first a brisk rose colour, then a pale blue, and very soon changes to a green colour. He says, the two first changes happen quick, and need a very quick and accurate observation to distinguish them, and therefore have not been taken notice of before.—And *ibid.* § 99. he mentions another proof of this acid, which is, that “a piece of tournsol dyed paper dipped in the un-
“ altered water changes first crimson, and then to a pale
“ red; which is to be done by no known means, but
“ that of acids.”—As a further proof of this acid, he says, *ibid.* p. 156, 7. § 105. that if filings of iron be thrown into these waters as taken from the fountain, that part of them is dissolved, and the water becomes a stronger chalybeate, though by standing the acid of these waters evaporates, and the water lets drop in form of rust both this additional quantity of iron and the iron with which it was originally impregnated.—And in part 3. p. 297. § 180. he affirms the same thing happens to the Bath waters when filings of iron are thrown into them.

water

water is alkaline on seeing it effervesce with acids, till we subject it to other trials, to know that the effervescence is not owing to the water's containing a volatile acid, which the fixed dislodges ^h.

The *nitrous acid* has been but very seldom, if ever, found in any of those waters called mineral, notwithstanding what authors have advanced of a nitrous salt being so common to be met with in them. Dr. *Hoffman* ⁱ alledges, that nitre ought to be looked upon more as a vegetable than a mi-

^h From the observation of some steel waters after they have let drop their iron and become effete, recovering their chalybeate qualities and again dissolving their iron as soon as they ferment, some chymists have concluded, that there was originally no volatile acid in these waters, which had evaporated when they dropt their iron as here above alledged; but that the acid in the water had united itself to other principles with which it had a greater affinity; and that it was again disengaged from them, and united with the iron by the fermenting process. However, I think, we can more easily account for the iron being again dissolved in these waters, by the fermenting process either generating a new acid, or disengaging part of that acid which was originally united with the phlogiston, and helped to form the oily or bituminous matter which is to be met with in all waters.

ⁱ *De Aquis mineralib.* sect. 1. N^o 40.

neral production; and affirms, that it has never hitherto been demonstrated to exist in any mineral water. But although it be true, that what authors have commonly called nitre, has in general turned out to be either the fossil alkali (the natron of the antients), or a calcarious Glauber salt; yet as we now know that nitre is got by lixiviating certain earths in the East Indies, and in North America; and that Mr. *Marggraf*^k got a small quantity of it from some

^k Mr. *Marggraf*, in the *Memoirs of the academy at Berlin for 1751, published in 1753*, tells of his having evaporated a hundred quarts of the water of a spring in the court of the palace at Berlin to half an ounce, and obtained eight grains of a pure nitre, which answered to every characteristic of this salt; besides a portion of nitre mixed with two drachms and a half of sea salt. Upon adding a fixed alkaline salt to the remaining water, it precipitated an earth, and he found on crystallising a salt composed of nitre and sea salt.

He evaporated in like manner a hundred quarts of the water of a fountain in the Electoral-street, and got three drachms of a salt composed of equal parts of nitre and of common salt.

And a hundred quarts of the water of a fountain in his own house, in the street of Spandaw, yielded one ounce, one drachm, and fifteen grains of a salt compounded of nitre and sea salt, but the greatest part of it a true and perfect nitre.

waters

waters in Berlin, and that Dr. *Home*¹ obtained a nitrous earthy salt from some hard waters in Scotland; it is not impossible but that other springs impregnated with a nitrous salt may hereafter be discovered, especially in, or near great towns.

The *muriatic acid*, or spirit of sea salt, has never yet been found pure in mineral waters, but often combined with the fossil alkali, and calcarious earths in sea water and the waters of salt and other mineral springs.

¹ Dr. *Home*, in his *Essay on Bleaching*, part. 4. § 2: p. 261. says, that in order to discover the contents of some hard waters, he added a fixed alkaline salt to soften them, and then evaporated and chrystallised. After a few trials, he got half a drachm of fine white chrystals, some of them half an inch long and exactly resembling the chrystals of nitre.—They had a cooling bitter taste—Emitted strong acid fumes which corroded silver on the addition of oil of vitriol—and brown paper dipped in their solution burned and sparkled like some of the same paper dipped in a solution of true nitre.—These characteristic marks, with their effects of turning flesh red when boiled in water with it, he thinks are sufficient to prove this to be a true nitre, for that no other salt possesses these properties.—He concludes with saying he believes, that the hardness in many waters is owing to an imperfect salt compounded of a nitrous acid and an absorbent earth; notwithstanding what some chymists have alledged of this acid not being to be met with in mineral waters.

The *vegetable acid* is no where to be found in the fossil kingdom, and therefore we are not to expect to meet with it in mineral waters.

Though the *vegetable alkali* be reckoned a vegetable substance, which we should not, *à priori*, expect to find in mineral waters, yet if Mr. *Marggraf* got a pure nitre from a water at Berlin ^m, or Dr. *Hoffman* ⁿ a salt resembling tartarus vitriolatus from the Seltzer water, after the addition of oil of vitriol, either the vegetable alkali or a salt approaching to its nature must have existed in these waters; whether it was lodged originally in the bowels of the earth, or drained thro' its upper stratum.

The *fossil alkali* has been found in many waters; seldom pure, but for the most part united to an acid in form of a Glauber or sea salt—Indeed, in some waters the acid, with which this alkali is combined, is in a very volatile state, and flies off as soon as heat is applied for evaporating the water,

^m Mr. *Marggraf loco citato*.

ⁿ Dr. *Hoffman Trait. de Aquis mineral. § 2, N° 29.*

and by these means this alkaline salt has been got seemingly pretty pure from some waters, in which it was originally combined with an acid. This seems to be the case with the Seltzer, and several other mineral waters which have a brisk vinous taste at the fountain.—However, as we know that this salt exists pretty pure in some parts of the earth °, it is not at all impossible, but that hereafter some waters may be found impregnated with it alone.

Dr. *Hoffman*, and most other late chymists have very justly rejected the *volatile alkali*, as an ingredient in mineral waters, it being no fossil matter; though some other chymical authors seem to think, or at least to suspect, that there is often a small portion of a volatile *alkaline* salt mixed with the natron, or native fossil *al-*

° In some places this salt is got running in thin veins. It is extremely pure, and has but a very small quantity of earth mixed with it, and appears like the purest natron or soda which had been dissolved in water, and afterwards boiled up into a thin cake, only that its crystals are much smaller than any which can be prepared by art, even from the same salt after it has been once dissolved in water. It makes pure Glauber salt with the vitriolic acid; and sea salt with the marine acid.

kali; and Mr. *Burlet*, as a proof of this volatile alkali existing in mineral waters, tells us, in the *Memoirs of the academy of sciences at Paris for the year 1707*, that blue paper stained red, with spirit of vitriol, recovered its *blue* colour by being put over the fountain of La Grille at Vichy; and Dr. *Henkel*, in his *Account of the Lauchstadt waters* in his *Bethesda portuosa*, seems to insinuate, that he had traced some vestiges of a volatile alkali in them. From what we know, it does not seem probable, that this alkali naturally exists in mineral waters; though it is not impossible but that waters which have stood in the open air till they have become putrid, or been mixed with putrid vegetable or animal substances, may give some marks of their containing a volatile alkaline salt.

II. The *inflammable substances* belonging to the mineral kingdom, alledged to have been found mixed with waters, are the *fossil oils*, and *sulphur*.

The *fossil oils* have been distinguished by the names of *Naphtha*, *Petroleum*, *Pisselæum*, *Pissasphaltum*, &c. as they are more or less

less pure. The finest sort has been called Naphtha; it is clear, extremely fragrant and volatile, and has a penetrating taste and smell; and it has been found in Italy and in Persia, and in many other of the eastern countries.—The Petroleum is reckoned the second sort, though this word has been often used, in a great latitude, to comprehend both the finest and some of the grosser kinds of the mineral oils: the others are all grosser kinds of the fossil oils.

These oils are commonly found either swimming on the top or at the bottom of the water of their wells; and the water, when separated from the oil, is pretty pure; though for the most part it retains something of the flavour or the taste of these oils.—The waters of such wells may have a strong taste and smell and be incorporated with the fossil oil, if they be impregnated likewise with the fossil alkali, or some other body which serves as a menstruum to dissolve and incorporate the oil with the water.—A small portion of an oily matter is found in all waters, even those esteemed the most pure; it is not discoverable in common water by the senses, but is found mixed with

with the solid contents obtained by evaporation p.

Sulphur has been long esteemed a mineral body very common to be met with in waters; and all those waters which have a strong fetid smell, resembling that of a foul gun, have been esteemed to be more or less impregnated with sulphur. However Dr. *Hoffman* seems to doubt much of its existence in the greater number of such waters; and Dr. *Lucas* ^q has affirmed, that it is not to be found in the form of sulphur in any water whatever; not even in that of Aix la Chapelle, where a true and perfect sulphur is found on the upper parts of the conduits through which the water passes; for he says, that, strictly speaking, these waters do not contain sulphur substantially dissolved in it, but are impregnated with a phlogiston and an acid, the principles of sulphur; which being in a volatile state are sublimed, meet on the surface of the conduits, and there unite into a true and

^p Ibid. vol. II. p. 21. § 48 and 49.

^q *Essay on Waters*, vol. III. § vii. p. 69, &c.

perfect

perfect sulphur, which did not naturally exist in the water; and he says likewise, that part of this sulphur falling back again into the water, is precipitated to the bottom of the baths, which gives the mud a black colour, and other sulphureous properties. His reasons for alledging that they do not contain sulphur are,—1st. That he thinks sulphur can only be dissolved in water by means of an alkaline salt, which gives the water a yellow colour; and on the addition of acids a hepar sulphuris is precipitated. But he says, this water is clear and colourless, and mineral acids preserve its pellucidity, prevent its becoming milky, and dropping a sediment.—2dly. That the waters themselves are not capable of dissolving either their own or an artificial sulphur.—3dly. That if three or four pints of this water be boiled with half an ounce either of their own sulphur, or of the flowers of common sulphur in a glass vessel, and kept boiling till two thirds of the water be evaporated, the remaining water does not shew any signs of its containing sulphur; but if the distillation or coction

coction be protracted still further, that some portion of the sulphur will be then dissolved in it, by means of its alkaline salt.

Dr. *Lucas* imagines likewise that the fetid smell, and property of tinging metals which many of the cold waters, called sulphureous, have, are entirely owing to their containing an oily matter and undergoing a putrefaction, which all waters are subject to; and he says, that upon trial he never found any of them give clear and certain proofs of their containing sulphur.

And he seems to think, that the flowers of sulphur, alledged to have been obtained by sublimation from the sludge of the waters of *Lucan* and *Lawrie*, were generated by the force of the fire subliming and uncorporating the phlogiston and vitriolic acid, which were not before intimately united in the waters.

From these arguments and experiments he has concluded, that no water contains sulphur.

Dr. *Rutty* in the *fifty-first volume of the Philosophical Transactions*, art. 28. has endeavoured to prove the existence of sulphur
in

in mineral waters from the following facts and observations.

1st. That the fetid smell of some waters is certainly not owing to mere stagnation, and a consequent putrefaction, since many of them have a brisk current.

2dly. That putrid rain water, and many chalybeats turned putrid by keeping, do not discolour metals; neither do they cure cutaneous disorders, as many of those waters called sulphureous do.

3dly. That the smell, flavour, and effects of some waters, and of their vapours in discovering metals, are perfectly similar to those produced by the artificial solutions of sulphur and of its vapour.

4thly. That many waters called sulphureous contain the native fossil alkaline salt, which is capable of dissolving and keeping suspended a small portion of sulphur.

5thly. That a milkiness or incipient precipitation is produced in several of those waters by dropping acids into them; particularly those at Aix la Chapelle^r, Mos-

^r Dr. Lucas, although he says, that mineral acids make this water clear, yet in *vol. 3. viii. § 276. 48. p. 89.* he tells us, that distilled vinegar made this water of a milky hue.

fat ^s, Harrowgate, Swadlingar, and Fermanagh ^t.

6thly. That a white hairy mucus is commonly precipitated on the sticks, or grafs, over which fuch waters pafs; and that at feveral fountains this mucus burns blue, and fmells of fulphur, and that true yellow flowers of fulphur had been got by fublimation from the fludge of the waters of *Lucan* near Dublin, and of the ftrong fulphureous water at Lawrie near Pettigoe.

7thly. That a true and real fulphur has been found floating in fome cold fulphureous waters, fuch as in thofe of Harrowgate ^u; however,

^s See Dr. *Plummer's* account of Moffat water in Edinburgh, *Medical Effays*, vol. 1. art. 8.

^t See Dr. *Rutty's Synopsis of mineral waters*.

^u Dr. *Peter Shaw*, in a note to p. 55. of the 2d edition of his tranflation of Dr. *Hoffman's Treatife on mineral Waters*, has thefe words, “ So likewise the *Harrowgate* fulphur “ *Spaw* contains actual brimftone, floating in it, like “ feathers, and feparable by bare ftraining; and the “ matter fo collected, I have, by proper trials, found to “ be good brimftone.”

And Dr. *Short*, in his *Account of Harrowgate Water*, mentions flowers of fulphur having been found under the bafons of that well. See his vol. I. part iv. and v. p. 285. 4to.

however, this last fact with regard to the Harrowgate water has of late been denied by many, as shall be taken notice of hereafter.

Although we cannot affirm, that any waters contain sulphur substantially dissolved, yet the effects of some of them on the human body seem to prove that they, at least, contain the sulphureous principles, so far united as to produce effects similar to those of the solutions of real sulphur; for Dr. *Lucas* tells us ^w, that *Aix la Chapelle* waters drank for a time, give a sulphureous smell to the whole body, tinge the patient's linen of a yellow colour, and even tarnish silver carried in the pocket, first

Though both Dr. *Shaw* and Dr. *Short* have asserted so positively, that real sulphur has been got either floating in the Harrowgate waters, or found under the stones at the bottom of the well, yet this fact is now denied, and some practitioners suspect that some mistake has been committed, and doubt whether ever a grain of sulphur was got from them; and therefore it is to be wished, that these waters, their basons, and the whitish matter that is found floating sometimes in the wells, and which adheres to the grass and sticks over which the water runs, were accurately examined by some good chymist.

^w See Dr. *Lucas's* account of these waters in his *Essay on Waters*, vol. III.

of a yellow, and then of a black colour; and we know that the *Aix la Chapelle*, as well as many other sulphureous waters, cure the itch when externally applied, in the same manner as sulphureous preparations; and that a real sulphur has been alledged to be obtained by evaporation * from others.

* *Monf. Colonne*, in his *Histoire naturelle de l'Univers*, tom. II. p. 25. tells us, that *Father du Tertre*, in his *History of the Antilles*, mentions a hot sulphureous water that springs from a burning sulphureous mountain near the sea; some of which he evaporated one day on a tin plate, and had remaining in the plate a layer of sulphur about the thickness of a leaf of paper, which burnt as soon as fire was applied to it.

“ Un jour je pris plaisir à faire evaporer de cette eau
 “ dans un plat d’étain, au fond duquel il y demeura
 “ l’épaisseur d’une feuille de papier de soufre vif, au-
 “ quel ayant mis le feu il brula tout aussitot.”

Baccius, in his *Treatise de Thermis*, mentions a hot sulphureous water in the country of Siena near to the castle of Petriolum, from which they prepare sulphur (unde sulphur excoquant); he says, there is an unctuous matter swimming a top of the bath, which when dried proves to be a true sulphur. The water is of a greenish colour above, and blueish at the bottom.

And *Dr. Pannonius*, in his *Hydographia Comitatus Trencsinensis*, published at Vienna in the year 1766, has affirmed, that he obtained a pure sulphur by evaporating some of the thermal water of Trencinium, which is situated on the river Wag in Hungary.

And

And an experiment related by Mr. *Macbride* ^y of boiling flowers of sulphur with quicklime and water, and thereby making a true and clear watery solution of sulphur, which does not become turbid, nor lets fall its sulphur on the addition of acids, shews, that sulphur may be dissolved in water by other means than by the mixture of alkaline salts; and that it is no certain proof of water containing no sulphur that it does not become turbid, or lets fall a precipitate on the addition of acids.

From what has been said, it should seem, that some waters contain the principles of sulphur so much combined as to produce effects, analogous in many respects to those of the solutions of sulphur, and therefore that such may be justly termed sulphureous; but with respect to what authors have said, of their having got a true sulphur by simply evaporating some sulphureous waters, we certainly cannot rely entirely on the

^y See Mr. *Macbride's Experimental Essays*, Essay v. on the dissolvent power of quicklime, experiment 3d.—Sulphur is dissolved in this manner in the preparation of the *sulphur præcipitatum* of the London Pharmacopœia; but the sulphur is there mostly precipitated by the addition of the vitriolic acid.

facts, till the experiments have been repeated with care by accurate chymists, and it has been fully ascertained that they committed no mistake, nor took a petroleum or other fossil oil for sulphur.

The particles, which yield the sulphureous smell in many mineral waters, are very volatile, and should seem to be composed of the fine phlogiston and some volatile particles of a fossil oil, slightly united to a volatile vitriolic acid; and hence they differ somewhat in their properties, as it exists in the water, from those of the solutions of common fixed sulphur ^z; both the phlogiston and oily matter, and the acid which compose it, seem to be in a volatile state. May not these sulphureous particles

^z Is it not probable, that a vapour from the Pyrites stone, similar to that which rises when iron and spirit of vitriol are mixed, is what gives the sulphureous smell and vinous and somewhat sulphureous taste to many waters, especially those of the chalybeate kind. For pure water put into a receiver, and fitted to a retort in which iron and spirit of vitriol have been just mixed, and begin to emit a fume, acquires a strong sulphureous smell and subacid, and somewhat sulphureous taste; gives no marks of sulphur on the addition of acids, or of its being acid by the addition of syrup of violets, and, like most natural sulphureous waters, loses both its sulphureous smell and its taste by being exposed to the air.

bear the same analogy to solutions of common sulphur, as the ammoniacal bear to the other neutral salts made with the fixed alkali? And does not putrefaction generate sulphureous particles, if they may be so called, in waters abounding with a mineral acid and a fine fossil oil, in the same way as it forms a volatile alkaline salt in animal and other substances which contain principles fit for that purpose? and may we not from thence account for some waters acquiring a sulphureous smell by putrefaction? If the substance got in the conduits of the Aponum baths, which Dr. *Vandellius*^a calls crystallised sulphur, and which he says dissolves in the thermal water by mere boiling, and restores its sulphureous qualities, be a species of true sulphur, it shews that nature is capable of generating a salt of sulphur, soluble in water, which was not before known.

III. Of metals, *gold, silver, lead, tin, bismuth, antimony, and mercury*, have never hitherto been found in mineral waters. Dr.

^a See *Dominic. Vandellii Tract. de Thermis agri Patavini*, p. 87. Patavii 1761.

Hoffman has very justly observed, “ that
 “ no metals are soluble, or can possibly enter
 “ the composition of waters, unless the
 “ metal be first dissolved, or turned into
 “ a salt or vitriol; but that no such thing
 “ has been found in the bowels of the
 “ earth as a salt of gold, silver, lead, tin,
 “ &c.” These metals have been almost
 always found in the state of an ore, not
 easily soluble in acids; if any of these
 metals be affected by waters impregnated
 with an acid, in their passage through the
 earth, they may be precipitated by calca-
 reous earths, or iron, before they reach its
 surface and burst out into springs.

Zinc united to the vitriolic acid in form
 of *white vitriol*, which is soluble in water,
 has been found native in earth, and authors
 mention it as an ingredient in mineral wa-
 ters, though none of them have hitherto
 given clear and certain proofs of its ex-
 istence in them, unless we admit that salt
 to be a true *white vitriol*, which *Dr. Rutty*
 describes as such, and affirms to have got
 in several waters in Ireland, which at the
 same time were impregnated with iron and
 other

other matters, and that Dr. *Gmelin* met with it in the Teinach water ^b.

The true metals which have been found in waters are *copper* and *iron*, both easy to be dissolved in any acid, and to be met with in every country. Waters, impregnated with iron, are to be found almost in every county in this kingdom; but although we have reason to believe that copper is often dissolved and mixed with water, yet copper springs are rare, owing probably to this metal having been precipitated by calcarious earths, or iron, before it reached the surface of the earth.

Arsenic is soluble in water but not without heat; it may perhaps be found in some springs, but luckily none such have hitherto been discovered.

IV. *Earths* of different kinds are to be met with in mineral waters.—In some waters the earth is only suspended, in others it is dissolved.

^b *Wallerius* in his *Hydrologie 2de classe, 31 espece, p. 96.* says, that Dr. *Gmelin* assures us, that there is a vitriol of Zinc in the Teinach water, as may be seen in his *Disput. de Acidulis Teinacensibus.*

The clays, marl, and other argillaceous and crystalline earths, which are not easy to be dissolved in acids, or are not affected by them, are for the most part only suspended.

But the calcarious earths, such as magnesia, limestone, spar, &c. which are soluble in acids and reducible to the state of quicklime by the force of fire, are for the most part dissolved.

It has been generally believed, that earths were always dissolved in water by means of an acid, excepting near to volcano's, or where they were reduced to the state of quicklime by the force of fire; however, Mr. *Macbride* * seems to think, that the earth in many petrifying springs is dissolved in the water by being some how or other deprived of its fixed air, (which he reckons the cementing principle of all bodies) in the bowels of the earth; this, perhaps, may be the case with insipid petrifying springs; but in all those waters which have a saline taste, and precipitate a white earth on the addition of the caustic alkali,

* See his *Experimental Essays*, Essay v. Exper. 21.

and yield a neutral earthy salt by evaporation, we are certain that the earth has been dissolved by means of an acid.

And the honourable *Henry Cavendish*^d has endeavoured to prove, that earths may be likewise suspended in water, by their being furnished with more than their natural quantity of fixed air, and has shewn by experiments that this is the case in the Rathbone-Place water; and from thence he concludes, that the unneutralised earth in all waters is suspended by the same means; and he very justly observes, that it is very remarkable, that earths should be rendered soluble in water, both by depriving them of their fixed air, and by furnishing them with more than their natural quantity of it.

The most common earthy salts, obtained from mineral waters, are the different species of the *calcareous Glauber salt*, which have very improperly been called *calcareous Nitre*s, for their acid is the vitriolic, and not the nitrous; they seem to have different earths

^d See *Philosophical Transactions for the year 1767*, vol. 57. art. xi. p. 92, &c.

for their basis; for they require different quantities of water to dissolve them; and the figures of their chrystals differ from one another, some going into small chrystals, such as the Epsom salt, and others into large chrystals, resembling those of the Glauber, and so forth ^e.

Alum is an earthy salt, which has long been suspected to be contained in mineral waters, though we have now but one account where its pure chrystals are alledged to have been obtained from any water; and no marks of it are to be found in most of the waters which were formerly called aluminous. The experi-

^e Dr. *Lucas*, in treating of the purging water at Epsom, seems to think, that the Epsom salt, or *sal catharticum amarum*, is not composed entirely of a fine calcarious earth and the vitriolic acid, but that this salt is a compound of the true Glauber salt mixed with a portion of a bittern, which is the reason of its going into small chrystals; but he says, that it may be freed of the bittern by repeated chrySTALLISATION, and that it will then form into large chrystals of the nature of a true Glauber; how far this may be true of the Epsom salts, experience must determine; but a solution of the large chrystals of most other waters turns milky or white on the addition of a fixed alkali, and precipitates an earth, which does not happen to solutions of the true Glauber salt, composed of the pure mineral alkali and the vitriolic acid.

ments,

O F W A T E R.

ments formerly made on the *Nevil Holt* water by Dr. *Short*, should have seemed to prove, that these waters contain a small portion of Alum, had not the Doctor, in a treatise published in the year 1765, retracted what he had before advanced, and told us, that he had formerly mistaken small whiteearthy floccules, lying between the dry saline chrystals of the *Nevil Holt* water, for Alum; he alledges, that Alum-stone taken fresh out of the earth gives no taste of Alum to water in which it is infused or even boiled, before it be calcined, and therefore it is probable, that we shall find no waters impregnated with Alum, except near to volcano's or places where there are subterraneous fires; or very near to Alum-works ^f.—If it be true, that the earth, at Solfaterra in Italy, yields a pure Alum by being boiled in water, as Dr. *Hill* has alledged in his *History of Fossils*, or that a native plumous Alum is found in some caverns of the island of Melos, and a solution of Alum dropping from others,

^f See Dr. *Short's General Treatise on various cold mineral Waters of England*, published in 8vo. in the year 1765.

as *Tournefort*, in his *Voyage to the Levant*, has told us, it is not impossible, but that in places heated by subterraneous fire, other waters impregnated with Alum may hereafter be discovered. We have but few certain proofs of any such having been hitherto found in places at a distance from volcano's, and where there is no appearance of subterraneous fire, though the experiments made with the Ballycastle water in Ireland, as related by *Dr. Rutty*, make it probable, that this water contains a *pittance* of Alum; and *Dr. Morris*, in the *Philosophical Transactions*, vol. 57. has affirmed, that he got true chrystals of Alum from the Somersham water in Huntingdonshire.

Selenite and *Gypsum* seem to be dissolved in many waters; but after they are separated, we cannot again dissolve them easily in pure water.

Such are the different solid substances with which the mineral waters, hitherto examined, have been found to be impregnated; but they are seldom to be met with single, but commonly several of them combined in the same water, and which makes it very difficult to determine exactly the contents

tents of mineral waters, and to ascertain the exact proportions of each impregnating material.

Besides these solid principles, authors have added a *subtile mineral spirit*, which they imagine has great virtues, because many waters become inert as soon as it is gone. This spirit should seem to be air intimately united with a volatile vitriolic acid; for waters, strongly impregnated with it, sparkle and discharge a large quantity of air-bubbles, when taken up at the spring-head; or when put under the exhausted receiver of an air-pump; they burst the bottles in which they are kept, or make the corks fly, if exposed to heat; and, if shaken in a bottle, filled only two-thirds, they rise and sparkle; and upon removing the finger they, with force, emit a pure vapour, which sometimes carries part of the water along with it.—When this spirit is gone, these waters often let drop their solid contents and become effete.

The inebriating quality, and brisk stimulus of most mineral waters, especially those of the chalybeate kind, seem to be owing to that gas or vapour which arises from the Pyrites stone when moistened with

with water, and to be analogous to that which arises in the solution of iron in the vitriolic acid. The smell of the Geronsterre Spaw and Pyrmont waters, and of the cave at Pyrmont, which is often filled with a suffocating vapour, seems to confirm this conjecture.

This vapour which arises from iron, in the time of its solution by the vitriolic acid, gives pure water a sulphureous smell, and somewhat of a brisk vinous and sulphureous taste, which resembles greatly the taste and smell of many of the natural chalybeate waters; and the water impregnated with this vapour, if exposed to the open air, loses both its smell and taste, in the same manner as most of the brisk spirity natural mineral waters do; and though it has a vinous taste, yet, like many of these waters, it gives no sign of an acid, when mixed with the syrup of violets or other blue tinctures of vegetable substances. Hence my Father, in *the third volume of the Edinburgh Medical Essays, published in the year 1735*, seems to believe, that it is a vapour of this kind which gives both the smell and vinous taste to most chalybeate waters, and endues them with that sulphureous penetrating

trating spirit which is found to pervade the minutest vessels of the human body.

The effects of this vapour are very remarkable in many of the brisk chalybeate waters; for fishes thrown into a basin full either of Pyrmont or Spaw water, taken up fresh from their fountains, fall soon into convulsions, and if not immediately taken out, die in less time than a minute. And the same thing happens to ducks, or other animals, thrown into the well before the pump room at Pyrmont, which is shewn, by way of experiment to most strangers, who come to that place.

The vapour in the cave at Pyrmont, which, when strong, suffocates animals put into it, has the same smell as the Pyrmont water when it first rises up into its basin, and is still fully impregnated with that vapour, or spirit, which kills fishes put into it, and suffocates animals which swim on its surface; but after the Pyrmont water has lost its smell and taste, by being exposed to the air, it has then no such effects; for fishes live and breed in the water of the fosse or ditch round the Prince of Waldeck's house at Pyrmont, and ducks and other

water.

water fowls swim on the surface, and dive into it without receiving any injury; these ditches are principally filled with the Pyrmont mineral water after it has been exposed for some time in the open air.

C H A P. III.

O F T H E M E T H O D S U S E D T O D I S C O V E R T H E C O N - T E N T S O F M I N E R A L W A T E R S.

TH E methods used to discover the contents of mineral waters may be reduced to five classes :

1st. The mixing with them, as taken from the fountain, coloured vegetable tinctures and infusions which strike different shades and colours, with the various matters with which waters are impregnated.

2dly. The mixing such substances as have a greater attraction, or affinity with

with the water, or with the acid in the water, than the solid mineral body already suspended &c.

3dly. The saturating them with fixed air, or the extracting air from them, according as certain substances are suspected to be dissolved or suspended in the waters, by their being either deprived of air, or containing too great a quantity of it.

4thly. The distilling or evaporating the waters, in order to catch those volatile parts which are not too subtile; and to procure the fixed solid contents, that they may be subjected to different trials, for finding out their nature.

§ If Mr. *Macbride's* theory of mineral bodies being often dissolved in mineral waters by their being deprived of fixed air, and reduced to a sort of quicklime, in the bowels of the earth, prove true; then the saturating of such waters with air will be another method necessary to be practised for discovering their contents; or if these bodies be often dissolved in water by their containing more than the common proportion of fixed air, as the honourable Mr. *Cavendish* has affirmed, it will be requisite in such cases to extract, by means of an air-pump, part of the fixed air, in order to ascertain the nature of the impregnating materials and the manner of their being impregnated.

5thly.

5thly. The spontaneous separation of some of the impregnating principles, when the waters are exposed to the open air.

I. In making experiments, on mineral waters with colouring substances, it is necessary to make the tinctures or infusions always of the same strength, and a like quantity ought to be mixed with an equal parcel of each particular water; for the same water will give a lighter or darker colour with a stronger or a weaker tincture of the same colouring substance, which may deceive us in judging of the strength of particular waters, and make us believe them to be more strongly, or more weakly impregnated with certain mineral bodies, than they really are; and hence those who make experiments, with waters, ought to endeavour to fix a general and universal standard. The difference of colour is nowhere more remarkable than in mixing galls or their infusions with chalybeate waters; and my father, the late Dr. *Alexander Monro senior*, professor of anatomy in the university of Edinburgh, has affirmed, in the *Edinburgh Medical Essays*, vol. 3. art. 7. that

that if too large a portion of the tincture of galls is at once thrown into any chalybeate water, for example sixty or a hundred drops into a quantity of water that requires only eight or nine, to bring it to its deepest colour, it will be so far from making it strike the colour stronger, or sooner, that, for several hours after, no change will be observed in the water; and at last it will gradually become of a deep sea green colour, instead of the purple or violet it would otherwise have turned to.

We know from chymical experiments, that the syrup of violets, and the juice or infusions of most blue vegetable flowers are not changed in their colour by pure water; but if the water be impregnated with an acid which still retains its properties, the blue is immediately changed into a red colour; and hence, by mixing such coloured infusions and tinctures with mineral waters, we discover if an acid be prevalent in them; and in this way (as we before observed) Mr. *Lemery* alledges, that he discovered an acid to be prevalent in the recent waters of *Passy*.—Messrs. *Regis* and *Dedier* in those of *Balaruc*,—and Dr. *Lucas* in

Vol. I. D those

those of *Spaw*.—As the acid is for the most part in a volatile state in mineral waters, the experiments ought to be made with the waters immediately after they are taken up from the fountains; because very soon the acid flies off, and an alkaline salt, a metal, or absorbent earth is left prevalent.

Waters impregnated with an alkaline, or with a metallic or earthy salt, turn the syrup of violets of a green colour.—In such cases, the mixture of an alkaline salt serves to determine the nature of the mineral bodies, with which the water is impregnated, for it makes no turbidness or precipitation if the water be impregnated with a pure alkali; but if it be impregnated with a metallic or earthy salt, it immediately becomes turbid, and precipitates the metallic or earthy matter, which may be subjected to further trials to discover its nature ^h.

The

^h Dr. Ratty, in his *Synopsis of Mineral*, mentions the the following changes of colour that different substances dissolved in water produce on syrup of violets.

The *common Alkali* and *Natron* strike a bright green colour.

The *calcareous Glauber salt* and true *Nitre* turn slowly green, and less intensely so than alkalies.

A weak

The infusion or juices of many red flowers, and other red vegetable substances, such as the red roses, the red poppies, the clove gilliflowers, the red cabbages, the the red betes, and many others, have their colour heightened by acids, especially by the vitriolic, but are changed to a pale yellow or green by alkalies, and absorbent earths. The infusion of the red roses gives a dark olive colour with solutions of iron.

Rhubarb in pure water gives a bright yellow tincture, which acids render pale, but which is heightened to a reddish colour by alkalies; it is also heightened, though in a less degree, by the calcareous Glauber

A weak solution of *sea salt* exhibited no green colour, though a stronger solution struck a deep green.

A strong solution of green vitriol gave a green.

————— of the blue vitriol gave a deep green.

A solution of alum, turned fresh made syrup of violets of a deep fine red, and then of a purple colour; but with syrup of violets, which had been kept, gave a light green colour.

A decoction of lime stone turned the syrup green.

Flowers of sulphur, rubbed with syrup of violets, acquired a reddish colour.

A solution of *Hepar Sulphuris* gave a green.

salt, and true nitre; and rendered of a brown or reddish colour by salt water, and turned to a dark olive by solutions of iron.

Logwood gives a bright red, or deep burgundy wine colour, to pure water; which is reduced to somewhat of a tawny by acids; but is heightened to a deep crimson by alkalies, and is heightened, though in a less degree, by true nitre and the calcareous Glauber salt.—Salt water extracts a crimson colour—a solution of green vitriol gives a mazarine blue, and a solution of blue vitriol a deep purple—and alum gives a deep red tending to purple.

Cochinelle gives water a high red colour, tending to a crimson, which is heightened by alkalies, but brought to the scarlet hue by acids; and if water is impregnated with metallic or earthy substances the colouring matter is precipitated.

Oak bark, galls, and all the astringent vegetables give their natural colour to pure water; alkalies have a greater affinity with water, and with the acid of these astringents, than their own earthy particles; and hence, when they are mixed with such tinctures

or

or infusions, a turbidness and precipitation ensues; and upon standing the tincture is changed to some shades of a green. — Acids dissolve the earthy parts of astringents and restrain the tinge, except in red flowers; but the earth of these astringents has a greater affinity with acids, than iron or most other metallic substances have; and hence, when infusions of such astringents are mixed with waters impregnated with metallic substances, a turbidness and afterwards a precipitation ensues; and with chalybeate waters they immediately strike a red or a purple, or black colour, according as the water is a weaker or stronger chalybeate, and in some time after the particles of iron are precipitated; but if immediately after the mixture of the water and the astringent infusion, such a quantity of acid be added, as is sufficient to dissolve both the astringent earth and the metallic particles, then the water recovers its transparency. — The calcareous Glauber salt turns greenish with the infusion of galls; sea salt often makes little change, though it sometimes gives a wheyishness, and sometimes a green

colour. Alum whitens and makes a precipitation with such infusions ⁱ.

These are the most common vegetable coloured tinctures and infusions used for making experiments with mineral waters, though a much greater variety may be employed for this purpose.

II. The second method we mentioned, for discovering the nature of mineral waters, was the mixing bodies which have a greater affinity with the water, or the saline menstruum, than the mineral substance already suspended.

Messrs. *Geoffroy's*, *Limbourg's*, *Le Sage's*, or other tables of affinities, will direct us in the choice of the substances to be used for this purpose, which must differ according to the matters we suspect the waters to be impregnated with.—Those most commonly employed are acids; the *fixed* and *volatile alkaline salts*; solutions of *soap*, and of some of

ⁱ Dr. P. Shaw, in his *Enquiry into the Contents, &c. of Scarborough Spaw Waters*, p. 53. tells us, that the plant called *Ragged Robert* (*Geranium Robertianum*) is said particularly to turn any water red wherein alum is dissolved.

the *metallic*, or *earthy substances*, and *milk*; to which it will be necessary to add *fixed air*, if Mr. *Macbride's* theory of its being the cementing principle of all bodies proves true.

Many mineral waters are impregnated with mineral bodies by means of the vitriolic acid; when this acid is in a fixed state, the addition of acids make no change on them; but if this acid be in a volatile state, then if any of the common acids be mixed with the water, as it is taken up from the fountain, and in full vigour, an effervescence immediately ensues, and this volatile acid is dislodged ^k. And it is from this principle, that Dr. *Lucas* accounts for the effervescence which follows, when we mix Rhenish wine and sugar with any of the Spaw waters.

If mineral waters be impregnated with sea salt, the vitriolic acid will dislodge the marine acid and occupy its place.—If any water be impregnated with a pure alkaline salt, or have a fine absorbent earth sus-

^k See Dr. *Lucas's Essay on Waters*, vol. II. p. 160. § 3, and 112.

pended in it, on the addition of acids an effervescence will ensue, and a true neutral or an earthy salt may be procured from the water.

If any water be impregnated with a pure fixed alkaline salt, or a true neutral, an alkali mixes smoothly with the water, without making any change in its appearance; but as alkalies have a greater affinity with acids than any other substance (except a phlogiston, under certain circumstances), immediately, on their mixture with waters impregnated with a metallic, or earthy substance, by means of an acid, they excite a turbidness, and a precipitation ensues; and the colour of the cloud which appears on the mixture, and of the precipitate which drops, is different according to the different matters with which the water was impregnated; the chalybeate waters afford an ochreous cloud and sediment; those impregnated with a pure absorbent earth, a white cloud and a white precipitate; and so forth.

The volatile alkali produces the same effects as the fixed; only with solutions of copper, upon being exposed to the air, it strikes a sapharine blue-coloured cloud.

A fo-

A solution of soap is decomposed, and curdles on being mixed with any hard water; that is to say, with water impregnated with an acid, or with earthy or metallic substances, by means of an acid; because the alkaline salt of the soap has a greater affinity with the acid in the water, than with the oil with which it was united in the form of soap.

The metallic solutions, commonly employed in the trials of waters, are, the solutions of silver, lead, or of quicksilver, in the nitrous acid: for this solution of silver, immediately on being mixed with water that contains either the vitriolic or marine acid, strikes a white cloud of a blueish cast, and a white precipitate ensues; and the solutions of lead and of quicksilver are precipitated in the same manner by the marine acid.

The dark colour and the blackish grumes and sediment which follow on the mixture of the solutions of silver, and of sugar of lead, with some waters, have been reckoned sure characteristics of their containing sulphur; as likewise have been their turning silver put into them of a black, reddish, or
yellow

yellow colour, and their brightening the colours of gold and of copper; however, these appearances are doubtful; for Dr. *Lucas* affirms, that most waters containing an oily matter, after they have fermented, or putrefied, produce the same effects.

Solutions of absorbent earths in the vitriolic acid, as in the different sorts of the calcareous Glauber salt, have sometimes been used to discover the nature of alkaline waters, as they are immediately decomposed by the mixture.

Waters, impregnated with a pure alkaline salt, have no effect in curdling milk, but mix smoothly with it; but if they contain a certain proportion of a calcareous Glauber salt, or of vitriol, or of alum, they coagulate it; though, when these substances are in very small quantity, they produce little or no effect.

If water be impregnated with earths deprived of their due quantity of fixed air, it lets drop these earths so soon as they are saturated with air; either by being exposed in an open vessel, or by a large quantity of air being forced into the water; or by dissolving in it some of the common fixed vegetable

getable alkali, or of any other substance fully saturated with air, which has a greater affinity with the water than with the fixed air.

And water, impregnated with earths, which contains more than its natural quantity of fixed air, lets drop these earths on the addition of lime water, or quicklime, or of any other substance which absorbs the preternatural quantity of fixed air; and likewise by being exposed in an open vessel, and discharging this preternatural quantity of air, which kept the earth, or other mineral bodies suspended in it, and by having the air exhausted by an air-pump.

Since the first sheets of this work were printed, Mr. *T. Lane* of Aldersgate-street gave in a paper to the Royal Society, which was read on Thursday the 23d of November; in which he mentions, that upon considering the experiments made by the honourable *Henry Cavendish* on the Rathbone-place water, to shew that earths were suspended or dissolved in many waters, by their containing more than the common quantity of fixed air, he began to suspect that water was often impregnated with other substances, by the same means; and

and he found by a number of experiments, that distilled water, saturated with fixed air, disengaged from fermenting and effervescing bodies, became a menstruum capable of dissolving and keeping suspended a certain quantity of iron, which it was not before; and that the water thus impregnated, acquired a vinous taste, and smell, and chalybeate properties similar to those of Spaw, and other brisk chalybeate waters; and that it was as difficult to prevent this air from evaporating, or escaping out of well corked bottles, as it is to confine what is called the mineral spirit in the natural waters. And hence he concludes, that the iron in the natural brisk chalybeate waters is often dissolved and suspended by a superabundant quantity of fixed air, and not by a volatile acid, as has been hitherto most generally believed; and that probably it will hereafter be found, that what is called the *mineral spirit* in waters, is nothing but this superabundant quantity of fixed air.

The repetition of experiments of this kind, and experiments made with the natural chalybeate waters at their fountains, can alone ascertain whether or not they are
impregnated

impregnated with iron in the manner here alledged; or whether air, disengaged from fermenting and effervescing bodies, does not carry along with it some fine volatile acid particles which effect the solution.

III. The third class of operations mentioned, for finding out the nature of mineral waters, was distillation and evaporation.

By the *distillation of waters* we obtain, with the water which comes over, the parts that are volatile, but not so subtile as to pass through the lutes of the retort and receiver.

As many substances are suspended in water by means of an acid, the water which comes over by distillation is often more or less impregnated with it; though the acid is frequently so subtile and volatile as to escape through even the best lutes we can employ, and is only to be discovered by observing red spots on blue paper put round the joinings of the vessels. The mineral spirit is too subtile to be separated in any visible or sensible form by common distillation, as is likewise the volatile phlogiston which is alledged to exist in many waters;

and which, Dr. *Lucas* says, ought to be distinguished from the oily matter to be found in all *waters*.

This volatile mineral spirit, though it is too subtile to be got in any sensible form by distillation, yet it is distinguishable in waters by their sparkling, and emitting a quantity of air bubbles when taken up from the fountain; and Dr. *Hoffman*, Dr. *Shaw*, and most writers on mineral waters, say, it is to be discovered to exist in them—by their fumes striking the nose—by their affecting the head—by filling bottles half full of the mineral water, corking them and bringing them near the fire, when they will burst the bottles, or make the corks fly—by their throwing up air bubbles when shaken—by their seeming to boil when exposed to a very gentle heat.—And Dr. *Shaw*¹ says, if you take an oiled bladder, press its sides together, tie its neck over the end of a matrafs which has been newly filled with a mineral water, and then put the matrafs on a gentle sand heat or into warm water, that, if the water contains much of the mineral spirit, the blad-

¹ See his *Treatise on Scarborough Waters*.

der will be very soon distended with it; and by tying the neck of the bladder, he thinks, we may weigh the mineral spirit, and subject it to other trials for discovering its nature.

This mineral spirit, though it is alledged by most authors to be a very subtile penetrating fluid, endued with many extraordinary virtues, yet from its properties it seems mostly to be air more or less fixed, and intimately united with the water, and perhaps a volatile vitriolic acid, which renders both more subtile and volatile^m; and hence it soon evaporates and flies off, especially if exposed to the open air.

In order to obtain the fixed solid contents of mineral waters, we must either distil them to dryness, or evaporate them with a slow fire in broad open wide-mouthed glass or stone vessels. By the last method the water may be evaporated much sooner, and with a much less degree of heat, than by the former, tho' the first is sometimes preferable.

It ought to be observed here, that in evaporating mineral waters, the slower the fire is, and the higher the sides of the vessels

^m If Mr. *Lane's* theory prove true, it may be found that the mineral spirit contains no acid.

in which they are evaporated, in general, the greater quantity, and the more genuine the quality of the solid contents which remain; and that, *vice versa*, the greater the degree of heat is used, and the lower the sides of the vessel, the less quantity of solid matter is left behind; and that, when the heat is very great, the force of fire is in danger of decomposing some of the natural principles of the water, and of forming new combinations that did not exist before. —And it ought likewise to be remembered, that at different seasons of the year, and in wet and dry weather, many mineral waters yield different quantities of solid matters; and hence we ought not to be surprised, that authors often differ so much in their accounts of the quantity of solid contents got by evaporation from equal quantities of the same water.

In order to determine the nature of the solid contents thus obtained; the first thing to be done is, to wash them repeatedly in warm distilled water, which will dissolve entirely the saline principles; and then to throw the whole into a filtre, when the water, impregnated with the salts, will pass through

through the paper, and the indissoluble metallic and earthy principles will remain behind in the filtre.

Then evaporate the water impregnated with the salts, till a pellicle appears on its surface; and let it stand to cool, and the salts to chrySTALLIZE; and try afterwards other experiments for determining the exact nature of the salts; in this way we may be able to find out the nature and nearly the quantity of the different salts with which waters are impregnated.

Mr. *Boulduc*ⁿ, in treating of the waters of Passy, mentions a method of obtaining their salts; he says, if you mix equal quantities of this mineral water (after it has deposited its iron) with alcohol, the water immediately becomes white, and if let stand drops all its selenite—Pour off the clear liquor, and add four or five ounces more of the alcohol, and the chrySTALS of the Glauber salt will shoot—Then decant again the clear liquor, and add four or five ounces more of the alcohol, and the sea salt will chrySTALLIZE. He adds, that if you

ⁿ *Memoires de l'Academ. des Sciences pour l'année 1726*, edit. in 8vo. p. 459.

concentrate the mineral water by letting it freeze, that the different salts will shoot easier and sooner.

The parts which remained in the filtre, and were not soluble in water, are the *earthy* or *metallic* particles mixed with more or less of an oily matter.

The *earths* found in waters are reducible to three sorts:—1st. The calcareous, which dissolve in acids, and may be reduced to quicklime by the force of fire.—2^d. The argillaceous, which are commonly not dissolved, but suspended by the water; they do not dissolve in acids, nor are reducible to the state of a quicklime by calcination, but acquire a stony hardness and dark colour.—3^d. The felenitical, which precipitate in form of flakes when the water is evaporated, and after this are not soluble in pure water, nor reducible to the state of a quicklime by the force of fire, though it may be thereby reduced to the state of a calx or plaister °.

The

° Under felenitical earths, we here mean to comprehend that sort of foliated scaly earth, which Dr. *Lucas* found mixed with the sediment of the Spaw waters; which, he
he

The metallic matters to be met with in mineral waters are principally those of iron and of copper, and sometimes of zinc.

Those of iron are of a brown or ochreous colour; they are alledged to be sometimes soluble in acids and attracted by the loadstone, though they are for the most part in form of a crocus, which has neither of these properties, till it be reduced back to the state of iron, by the force of fire, and the addition of a phlogiston.

Those of copper are soluble by acids, are precipitated by, and give a copper colour to iron; and, when dissolved by acids, give a sapharine blue on the addition of the volatile alkali.

Those of zinc precipitate in form of a brown ochre, and with the vitriolic acid form a white vitriol p.

The

he says, is insoluble in water and acids, and unalterable by fire; and likewise *Talc*, *Gypsum*, and other foliated shining earths, which are reducible to the state of a calx (fit for forming a cement or plaister with water) by the force of fire; but do not thereby acquire the state of quicklime, or afford an *Aqua Calcis* with water, nor do they ferment with acids.

P *Wallerius* in his *Hydrologie*, 2de classe, genre viii. espece 22. § 3. says, that the vitriolic water of zinc contains

The oily matter is known by its effects, but its quantity is not always easy to be ascertained, for we cannot often separate it from the other contents; but when the solid contents of waters are thrown into an ignited crucible, it is this that goes off in form of a subtile vapour, manifested by the smell and a visible fume, and which sometimes flames when it is in large quantity.

IV. The last method we mentioned for discovering the contents of mineral waters, was the examining the spontaneous separation of some of the impregnating principles, when such waters were exposed to the open air.

Earthy or metallic matters which are dissolved in water by means of a volatile acid, separate from it when the acid evaporates, and sink to the bottom, if they

white vitriol; that it does not change the colour of fyrup of violets, nor makes an effervescence with any acid; that it has a vitriolic and astringent taste, and fixt alkalies precipitate the earth of the zinc; that the best method of discovering that a water contains zinc, is by the yellow colour which the earth, precipitated from the water, gives copper when laid in *cementation* with it, *i. e.* laid in alternate layers with it, and exposed to a strong heat.

be

be specifically heavier than the water; but swim on the surface in form of a scum, if they be so much subtilised, or so much divided, as to be specifically lighter.

The same thing will happen when a mineral water is exposed to the open air, if metallic or earthy particles be dissolved in it by being deprived of air, for these bodies will soon attract a sufficient quantity of air from the atmosphere to saturate them and render them insoluble in water; and they will separate likewise when they are suspended by means of too large a proportion of fixed air, if part of the air be extracted by means of an air-pump; or if it be allowed to evaporate by standing in an open vessel.

In the scum and sediment of mineral waters, we find sometimes a small portion of the oily matter, common to all waters, mixed with the earthy and metallic particles which have been separated, either by their losing their acid, or by attracting air from the atmosphere; and we find likewise such particles mixed with them as have been suspended, but not dissolved in the waters.

Thus the waters called sulphureous generally throw up a white scum, which is

composed of a fine earth mixed with an oily matter, and the earth in the bottom of their basons is of a black colour from a mixture of the same oily or sulphureous matter; and there is often observed a number of light bodies floating in such waters, which have been alledged by Dr. *Short* and Dr. *Rutty* to be an assemblage of sulphureous particles, which sparkle and smell when put on the red-hot iron, and often give a flame which is sometimes of a white and sometimes of a blue colour, but which, by latter trials, should seem to be composed of the same matter as the scum or sediments.

The chalybeate waters often drop their ochre, and a quantity of earth, on being exposed to the air, and they generally throw up a bluish variegated scum, which is sometimes composed of a fine subtile ochre, sometimes of an ochre mixed with a fine calcareous or other earth, sometimes with a fine oily matter, and at other times with both.

Other waters throw up a scum or deposite a sediment of different sorts, according to the various matters with which they are impregnated.

The

The spontaneous changes which waters undergo by being kept either in open or in well stopt glass vessels, ought likewise to be particularly attended to, in order to assist us to know more exactly their nature and properties: and in considering mineral waters, their specific gravity as they are immediately taken up from the fountain with respect to pure distilled water, and their temperature with respect to the external atmosphere, ought particularly to be ascertained.

O F

MINERAL WATERS.

HA V I N G considered the general properties of water, the various matters with which it is found impregnated in the bowels of the earth, and the methods taken to discover their nature, we shall next take a general view of some of the mineral waters which are best known and most esteemed in this country. And shall divide them into two general classes, the **COLD** and the **HOT**; and consider each class under the four following general heads:—1st. Those impregnated with *acid, alkaline* or *neutral salts*.—2d. Those which contain a *fossil oil* or *sulphur*.—3d. Those impregnated with some *metallic matter*.—4th. And those which have an *earth* either suspended or dissolved in them.

In considering mineral waters, a great difficulty arises in classing them properly; for we seldom meet with any which are
 impregnated

impregnated with one matter only; but generally with several, and those belonging to different classes of bodies; and therefore, wherever any substance is prevalent in a water, I shall rank that water under the class to which that substance belongs; tho' at the same time the water may be impregnated with other matters, which might seem to entitle it to be put in another class.

If any mistake is committed, in the general arrangement, it is of the less consequence, as each of the waters is particularly considered.

P A R T II.

O F

COLD MINERAL WATERS.

C L A S S I.

O F S A L I N E W A T E R S.

UNDER this head of saline we shall consider those waters, in which either an *acid*, an *alkaline*, or a *neutral salt* is prevalent; as likewise those which contain a *calcareous Glauber* or *Epsom salt*, as they approach so near to the true Glauber in their medicinal properties, though such waters would perhaps be placed more properly in the fourth class, amongst those which contain an earthy salt.

C H A P.

C H A P. I.
OF ACID WATERS.
I T A L I A N.

LATERA. SELVENA. SICILY.

THOUGH most mineral waters are impregnated with mineral bodies by means of an acid, yet hitherto we know of but few which contain an acid only; for *acids*, in their passage through the earth, mostly unite with some alkaline, metallic, or earthy matter, and are found joined to such bodies in mineral waters; however, we have one or two instances where this has not happened; for Dr. *Vandellius*, in his treatise, *De Thermis agri Patavini*, published in 1761^a, mentions a cave near

^a *Cap. 3. p. 95, &c.* He observes, that there are a number of sulphureous waters in this neighbourhood; and he says, that one would imagine, that this acid distilled from mines of vitriol or pyrites stone decomposed by subterraneous fire. The country people dare not enter this cavern, but in winter, or when it blows a north wind; for at other times they are in danger of being suffocated.

to the town of *Latera*, which is about thirty-two miles from Viterbo, in which a clear acid water drops from the crevices of the rock, and is collected by the country people in glazed earthen vessels. He says, it has a mild acid taste, and by chymical experiments is found to be a true vitriolic acid, diluted with much water. And he observes, that *Theophilus Grifsonus* mentions a like native vitriolic acid which is brought to Siena, from another place, that is at a small distance from the town of Selvena, that lies about forty-six miles from Siena; and it has been alledged, that some acid waters have been found in the island of Sicily^r; and, as we before observed, an acid has been found to be prevalent in some mineral waters, when taken up immediately from the fountain^s.

^r See *Varenius's System of General Geography*, § iv. chap. xvii. prop. vi.

^s The acid waters of Sicily and those of Latera, and Selvena, are mentioned both here among the cold waters; and likewise among the warm, it being uncertain from the description to which general class they belong.

C H A P. II.

OF WATERS IMPREGNATED
WITH THE FOSSIL ALKALI.

THE waters, which contain the native alkaline salt are often in a neutral state as taken up from the fountain, the alkali being saturated with some of the mineral acids; and hence they decompose soap, or curdle with its solutions; and some of them are strongly impregnated with a mineral spirit, and have a brisk vinous taste at the fountain. But their acid or mineral spirit being in a volatile state, flies off when they are exposed to heat, or when they stand long in the open air; and when they are evaporated, they leave an alkaline and not a neutral salt behind; and hence it has been alledged, that they contained no acid.—However, it is not at all impossible, but that waters may hereafter be discovered, in which a native alkaline salt is prevalent in their original state.

Many of these waters yield on evaporation, some Glauber or sea salt, or some metallic or earthy matter, besides a native alkali.

The

Those belonging to this class are all of them powerfully diuretic, and esteemed useful for removing glandular obstructions; and where the salt is in large quantity, they are commonly more or less purgative in proportion to the quantity they contain.

The waters which we shall consider under this head, are,

ENGLISH.
TILBURY.
CLIFTON.
GLASSENBURY.

IRISH.
TOBER BONY.
CARRICKMORE.
St. BARTHOLEMEW.
CAPE CLARE.

GERMAN.
SELTZER.
BUCHENSES.

WILDUNGAN.
TONSTEIN, or AN-
TONIAN.

FRENCH.
MARQUISE.
DE POUQUES.
DE St. MION.
DE St. FLORET.
DE PONTGIBAULT.
DE JOSSE.
St. ARBAN.
PONS DE CAMERET.
DE VAHLS.

ENGLISH.

TILBURY.

The spring which affords this water is situated near a farm-house at West-Tilbury,
in

in the county of Essex, and was first particularly examined by Mr. *André* in the year 1736, who published afterwards an account of it.

This water is not quite limpid at the well, but has something of a straw-colour hue. It is soft and smooth to the taste, though, after being agitated in the mouth, it impresses a small degree of roughness on the tongue.—It throws up a variegated scum which feels unctuous, and effervesces with spirit of vitriol.

It mixes smooth with milk, but curdles with soap.—When boiled it turns milky; a fourth part of Mountain wine fines it immediately, and all acids do the same.—Both *Oleum Tartari per deliquium* and the volatile alkaline spirits make a white precipitate.

Dr. *Rutty* says, that *lixivium* of tartar occasioned a wheyishness and white cloud, but caused no instantaneous precipitation; and that lime water turned it milky, and made it drop a sediment.

The solution of the sugar of lead instantly exhibited a gross white cloud and curd, with air-bubbles on the sides of the
glass

glafs on ftanding.—The folution of filver instantly precipitated a grofs white curd, which after fome time turned blue.

Acids, particularly oil of vitriol and fpirit of fea falt, occafioned a ftrong ebullition and rendered it remarkably limpid.

It turned fyrup of violets of a deep green on ftanding ;—though Mr. *André* obferves, that it was a quarter of an hour before the recent water effected this change, but when warmed, it turned the fyrup green in much lefs time, and when boiled, in one minute.

It remained clear in bottles, after being kept four months.

When poured into a glafs, a number of minute air-bubbles form on the fides ; and an explofion follows the opening of a bottle in which it has been kept, which fhews it to contain a quantity of air.

Evaporated, Dr. *Rutty* fays, a gallon on a medium yields a hundred and eighty grains of a refiduum, which is of a brown yellowifh colour, and has a fharp urinous tafte.—Tho' Mr. *André*, in the two trials he made, tells us, that in one he got fixty, and in another fixty-three grains of a fubftance of the colour of Jefuits Bark, of a
pungent

pungent taste from a quart, which is in the proportion of two hundred and forty and two hundred and fifty-two grains from the gallon.

This residuum on trials was found to be composed of an alkaline salt and a calcareous earth, with a small quantity of an oily matter common to all waters, which it manifested by sparkling on the red-hot iron.

The proportion of the earth to the salt, Mr. *André* says, is as one to two; but Dr. *Rutty* tells us, that in one trial he made, it was only as one to eight, and in another as one to five.

The *earth* calcined to quicklime, and fermented with acids.—The salt gave every mark of a native alkali, only its solution did not redden mutton.

It dissolved almost entirely, in twelve times its own weight of water.

This water operates mostly by urine, though it purges some people on first drinking it.

A quart is reckoned a middle dose.

It has been recommended in diarrhœa's and old dysenteries, in disorders of the sto-

mach from acidity, in the gravel, in the fluor albus, in immoderate fluxes of the menses, and in many other disorders.—And Mr. *André*, in his *Preface to the Account of the Water*, has alledged, that it is as true a specific for diarrhœas and all kinds of fluxes, as the bark is for intermitting fevers.

CLIFTON.

The well lies within a mile of Deddington in Oxfordshire.—The water contains a native alkaline salt, but in less quantity, and with a greater mixture of other principles than the *Tilbury*.—It is clear and has but little taste at the fountain.

Dr. *Rutty*^t, in his *Account of this Water*, says, it exhibited a clay sediment with oil of tartar, turned of a pearl purple with a solution of silver, milky with a solution of lead; struck a grass green with syrup of violets, and yielded a light purple with logwood.

Evaporated, ^u Dr. *Short* tells us, that a gallon yielded seventy-four grains of se-

^t *Synopsis*, p. 429.

^u Dr. *Short*, vol. ii. p. 133.

diment,

climent, nine of which were earth, and sixty-five of a peculiar kind of nitre or soda, and some white sand (or selenite); and he says, “this is a fine laxative water, “being pretty rich in the most alkaline “salt I have seen in any water w.”

Dr. *Rutty* ^x, who tried some experiments with the salt of this water, mentions, that it has a yellowish colour, an urinous smell, and tastes bitter and brackish.

It neither crackled nor rose into blisters on the red-hot iron; but it sparkled, stunk, and burnt black. He adds, that its solution curdled with soap, though it kept clear with oil of tartar; it turned syrup of violets green, and fermented with acids.—A scruple of the salt was not entirely dissolved in four ounces of water. From all which the Doctor concludes, that the salt is of an alkaline nature with a mixture of a nitrum calcarium, or calcareous Glauber salt.

The earth was of the calcareous kind.

This laxative water has been much used for baths in cuticular disorders.

^w Ibid. p. 81.

^x *Synopsis of mineral Waters*, p. 430.

GLASSENBURY in SOMER-
SETSHIRE,

Is a weak water of the same kind with a small mixture of sea salt; it is naturally sweet, but by keeping becomes putrid.

By evaporation a gallon yields from twenty-four to thirty-six grains of a sediment, which, Dr. *Rutty* says, seems to be composed of a native alkali with a small proportion of calcareous Glauber and sea salt, and some earth.

IRISH WATERS.

TOBER BONY.

This spring is situated about four miles north of Dublin: the water is sweet, and soon lathers with soap. Dr. *Rutty* says, that by evaporating, a gallon yields about twenty grains of a residuum; of which four parts were a yellowish native alkaline salt, and three a calcareous earth. From the well having a little foetor before rain
and

and wind, and from the sediment turning black and stinking on the red-hot iron, the Doctor concludes, that the water has a pit-tance of sulphur in its composition; though more probably an oily or bitumenous matter.

CARRICKMORE,

Is five miles from Belturbet in the county of Cavan: the water has a soft milky taste like Bristol water, and putrefies by keeping.

It curdles soap, and exhibits a white sediment with a solution of salt of tartar.

Evaporated, a gallon yielded twenty-two grains of a white sediment, which, Dr. *Rutty* says, on trial was found to be composed of a calcareous earth, a calcareous Glauber, and a native alkaline salt.

From the water putrefying, he adds likewise a little sulphur; but I think without any reason.

ST. BARTHOLOMEW'S WELL,

Situated two miles south-west from the city of Cork: this water is soft and mixes

smoothly with soap; by keeping it putrefied, and then it tinged silver, and threw up a very foetid scum, which had somewhat of a ferruginous taste; and galls gave it a violet purple colour, which they did not do to the fresh water.

Evaporated, a gallon at a medium yielded twenty-four grains of a sediment, which on trial proved to be mostly made up of a native alkaline salt.

CAPE CLEAR,

Situated on the most southern land in
IRELAND,

Is a smooth salt water which lathers with soap.

By evaporation, a gallon yielded thirty-two grains of a sediment composed mostly of a native alkali, with a small proportion of sea salt.

GERMAN ALKALINE WATERS.

The German *alkaline waters* which we are next to consider, when fresh are brisk
and

and pungent, and seem to be plentifully impregnated with a mineral spirit, or to contain more of a subtile volatile acid, than any waters hitherto discovered in Great Britain or Ireland.

S E L T Z E R W A T E R,

Is got from a spring near to the town of Nieder Seltzer, in the bishoprick of Triers.

This water at the fountain is limpid, and at first has somewhat of a brisk subacid pungent taste; though it leaves behind an impression of a lixivious solution in the mouth.—By being exposed to the open air for twenty-four hours, Dr. *Hoffman* says, it loses entirely its original taste, and acquires that of an alkaline lixivium; and that he knew of no medicinal water which putrefies so easy as this.

The fresh water made an immediate effervescence with all acids, and a strong ebullition with Rhenish wine and a little powdered sugar &c. It curdled with a solu-

^v See Dr. *Hoffman* on Seltzer Water, in his *Treatise on the principal mineral waters of Germany*.

tion of soap. Oil of tartar dropt into it made it milky, but it did not let fall any precipitate.—It did not give the least mark of a chalybeate by being mixed with galls.

Dr. *Hoffman* evaporated this water, and from two pints he obtained seventy-two grains of a residuum, which is in the proportion of two hundred and eighty-eight grains from a gallon.—By lixiviating these seventy-two grains, filtrating the lixivium through paper, and evaporating a second time, he obtained two scruples of a pure alkaline salt.

Dr. *Rutty* tells us, that the salt he obtained from this water gave every mark of a native alkali, except that its solution did not redden beef.—Both Dr. *Rutty* and *Cartbeuser* (in his *Rudimenta Hydrologiæ*, sect. 26.) affirm, that this salt has a mixture of an alkaline earth and of sea salt; that the sea salt shews itself by the crackling which follows, when some of the sediment is thrown on a red-hot iron; by the acid fumes that arise when oil of vitriol is dropt on it; and by the white cloud which appears when a solution of silver is dropt into this water.

The exact quantities of the other solid matters, besides the native alkaline salt, are not mentioned by authors.—This alkaline salt seems to be mostly saturated with a fine volatile vitriolic acid in the water, as taken fresh from the fountain, or the water contains a very great quantity of the mineral spirit.

The Seltzer waters operate chiefly by urine; they are not purgative. Dr. *Hoffman* says of them, that for diluting and washing of acid and ill-concocted humours, correcting the bad habit of the blood and juices in arthritical and gouty persons, and for relaxing and restoring the contracted nervous parts, there is not a safer, a surer, more immediate and effectual remedy, than the Seltzer water drank with milk. They have been given much in scorbutical, phthi- sical, and nervous disorders, either by themselves or with milk, and have been found to produce the best effects.

B U C H W A T E R S.

The Aquæ Buchenses, called in the German language, *der Buchsauerling*, lie about about a German mile from the Caroline baths in Bohemia.

The

These waters at the fountain have a brisk pungent taste; and Dr. *Hoffman* says, are plentifully impregnated with a mineral spirit; by being exposed to the air this spirit flies off, and they become insipid, whereas the Seltzer water acquires a lixivial taste by standing.

They are much more weakly impregnated with an alkaline salt than the Seltzer; two pints evaporated left only twenty two grains of a residuum, sixteen grains of which were a pure alkaline salt, the other six an earth.—The residuum gave no signs of a mixture of sea salt by any trials which were made.

These waters, though drank in large quantity, do not purge, yet operate powerfully by urine; if a due proportion of spirit of vitriol be added, it gives them a different taste and a purgative quality.

H E I L S B R U N N.

This water, situated at the town of Heilsbrunn, in the marquisate of Anspach, is thought to contain a fine alkaline earth and an alkaline salt, besides a mineral; for Dr.
Reiger

Reiger says, both the water, and the sediment left after evaporation, effervesce with oil of vitriol, and afterwards taste bitter, as if they had contained a neutral salt. See *Commer. Litt.* 1731 and 1732.

WILDUNGAN WATERS.

The spring which affords this water is situated at Wildungan, in the country of *Waldeck*.

The water is of the same kind as the *Buch*, but is more weakly impregnated with alkaline salt.—At the fountain it has a brisk subacid taste, which it loses by being exposed to the air. *Dr. Hoffman* says, that two pints of this water evaporated left twelve grains of a residuum, *viz.* Four grains of an alkaline salt; eight of a white calcareous earth.—He says, that they are one of the mildest acidulæ known, and for that reason may be used as common drink by themselves, or mixed with a small portion of wine, and although they are not strong enough to remove obstinate chronic affections and clear the first passages, yet that they are excellent for blunting and diluting

luting acrid, scorbutic, and arthritic humours, taken in large quantity and for a considerable length of time.

TONSTEIN OR ANTONIAN W A T E R S,

In the Bishopricks of C O L O G N.

Dr. *Hoffman* says, are among the most noted waters in Germany; they have a brisk subacid taste at the fountain, which they lose by being exposed to the air; they are clear and limpid, when taken up from the well, but become turbid by standing.

They contain a greater proportion of earth than the Seltzer waters, and like them have a mixture of sea salt.

Two pints evaporated left two scruples of a residuum, of which *Hoffman* says, one half was a chalky earth, the other a salt compounded of the native alkali and sea salt.—He says, this is a very spiritous water which operates mildly by stool, and by urine; and that it may be used for common drink with great advantage, either by itself or mixed with wine, both in acute and chronic disorders.

F R E N C H

FRENCH WATERS.

CONTAINING A NATIVE
ALKALINE SALT.

From *Du Clos's* account of mineral waters, there seems to be in France a great number of brisk subacid waters which contain a native alkaline salt, similar to the German ones we have been just considering; but as we have no particular history, nor any accurate analysis, we can do no more than mention what he has said of them.

VAHLS.

LA MARQUISE ET LA
MARIE,

Near to VAHLS in DAUPHINY,

Is the well which affords this water. *Du Clos* ^z says, it had a brisk subacid taste at the fountain, which it lost before it reached Paris; for it then tasted saltish.

^z See *Du Clos Tractatus de aquis mineral. Galliae.*

Evaporated

Evaporated, it yielded $\frac{1}{135}$ part of a pure lixivial salt, the nitre of the antients ; which is in the proportion of four hundred and fifty-five grains to the gallon ; allowing sixteen ounces to each pint.

It is purgative and diuretic.—Near to this is another spring called *La Marie* of the same nature, but which contains a less proportion of a native alkaline salt. It is said to be more acid at the fountain.

DE P O U G U E S.

The water at *De Pougues* in the *Nivernois*, is subacid and unpleasant at the fountain ; and *Du Clos* says, he evaporated it, and obtained $\frac{1}{492}$ part of a residuum, one third of which was a native alkaline salt or natron ; the other two thirds an earth which dissolved in wine vinegar.

So each gallon yielded one hundred and twenty-four grains, and above six sevenths of a grain of a residuum ; of which $41\frac{1}{3}$ grains were an alkaline salt, $83\frac{2}{3}$ a calcareous earth.

ST. M I O N.

The waters of St. Mion, situated in the *Auvergne*, are limpid at the fountain, and have a brisk subacid vinous taste.

Du Clos says, that although they had no acid taste when they were brought to Paris, yet they made the juice of the tournsol a little red; and that a small quantity of the first water that came over in distilling them with a *balneum mariæ*, turned the tournsol red, and made a solution of sublimated mercury turbid. These experiments deserve to be repeated, both at the fountain and after the water has been kept for some time.

He evaporated these waters; in doing which white pellicles formed on the surface, which were successively precipitated, and he at last obtained a white grumous sediment of a lixivial taste, which weighed about $\frac{1}{300}$ part of the water; near two thirds of this was a natron, the other third an earth which dissolved in wine vinegar.

So

So each gallon of water yielded $204\frac{4}{5}$ grains of residuum, of which 136 grains were a native alkaline salt, 68 a calcareous earth.

ST. F L O R E T,

Situated near to the SAINT CIRQUE in the
A U V E R G N E.

Is a limpid subacid water of the same kind, which, on being evaporated, yielded a yellow foliated saline sediment, which was about $\frac{1}{3\frac{1}{2}}$ part of the whole. So that each gallon of the water contained $196\frac{2}{3}$ grains, near one half of which was a natron, the other a calcareous earth.

P O N T G I B A U L T,

In the A U V E R G N E,

Is likewise a limpid subacid vinous water, which by evaporation afforded a sediment about $\frac{1}{5\frac{9}{10}}$ part of its own weight, and hence each gallon contained $104\frac{1}{7}$ grains, of which above one half was a natron, the rest a calcareous earth.

D E

DE JOSSE LE MARINGUES.

At this place there are two springs.—
1st. The Petit; and 2d. The Grand Bouillon, of which the last has the most brisk vinous taste.—Evaporated, they yielded $\frac{1}{3\frac{1}{4}\frac{1}{3}}$ part of sediment, or $177\frac{2}{3}$ grains from a gallon, of this above one half was natron or the native alkali, the rest a calcareous earth.

SAINT ARBAN EN FOREST.

This water, in evaporating, threw up a pellicle which felt like sand in the teeth, and yielded $\frac{1}{6\frac{1}{4}\frac{1}{6}}$ or $95\frac{2}{3}$ grains from a gallon, of which one half was a foliated alkaline salt, the rest an earth which dissolved mostly in vinegar.

DE PONT DE CAMERET,
IN LANGUEDOC.

Here are two springs.—1. *Andabre*.
2. *Prugniez*. In evaporating they threw

up no pellicle, but a number of little flocculi were observed floating in the water.

1. The *Andabre* yielded $\frac{1}{202}$ of sediment, or 307 grains; that is, five drachms seven grains from a gallon, of this three fourths were natron, the remainder an earth which mostly dissolved in vinegar, and vitrefied by a strong heat.

2. The *Prugnies* yielded only $\frac{1}{384}$ or $159\frac{2}{3}$ grains from the gallon, of which one half was salt, the rest an earth less soluble in acids and less fusible in the fire.

All those waters mentioned by *Du Clos* ought to be examined at the fountain head, and proper experiments made there to determine their nature more exactly.

C H A P. III.

OF WATERS IMPREGNATED
WITH A TRUE GLAUBER
SALT.

IN the accounts of the analysis of mineral waters, we have mention often made of their containing a pittance of true Glauber salt; but hitherto there has been no account given of any water where this salt has been found in large quantity, and where it has been the principal matter with which it was impregnated; however, I make no doubt, but that such may be found, as we know that the native fossil alkali is to be met with in many parts of the world, and that the vitriolic acid abounds every where almost in the bowels of the earth.—If a salt which was brought to London for sale, as a true salt of some of the mineral waters in England, was genuine, and no trick used in the preparing it, this salt certainly is in much larger quantity in some of our mineral waters than has hitherto been imagined.

C H A P. IV. OF NITROUS WATERS.

ALTHOUGH a small pittance of a true nitre, composed of the vegetable alkali and the nitrous acid, has been obtained from some waters in Berlin and London, and other great cities, yet none has been hitherto observed in any of the waters commonly called mineral, situated at a distance from large towns. Perhaps, however, a *true nitre* may hereafter be found, in considerable quantity, in waters which are situated near to those earths from which it is prepared, in the East-Indies, in North America, Africa, and other parts of the World.

C H A P. V.

OF WATERS IMPREGNATED
WITH SEA SALT.

THE earth every where abounds with this salt; and besides that great body of salt water, the sea, we meet almost with no spring, river, or lake, which is perfectly free from it; and in most countries we find springs or wells in which this salt abounds.

At present, in considering the waters of this class, I shall first examine *sea water*.—

2. The salt springs which are strongly impregnated with it.—3d. and lastly, Those in which the sea salt is found in small quantity, or mixed with a calcareous Glauber salt, but where it is prevalent; and shall leave those waters which have a sulphureous smell, or which abound with a fossil oil, or are impregnated at the same time with iron, or some other metallic matter, till we come to consider those other classes.

Waters are known to contain sea salt by the smell and fumes which arise on the ad-

dition of oil of vitriol, or by dropping this acid on the residuum left after evaporation; by the milkiness and white cloud which follow on mixing a solution of silver or of lead with them; and by the solid contents of such waters, obtained by evaporation, crackling and flying when thrown on a red-hot iron.

S E C T. I.

S E A W A T E R.

TH E water of the sea is of a greenish colour, has a salt, bitterish taste, and becomes extremely foetid by keeping.

From the variety of bodies that are every where floating in the sea, the variety of lands it covers, the shores it washes, and the infinite number of springs, rivers, and brooks which discharge themselves into it, its water has been alledged to be impregnated with a variety of matters; but altho' it be true, that it is impregnated with certain substances in particular parts of the ocean, yet, in most of our northern countries,

tries, the impregnation is pretty simple and uniform; tho' the proportion of the contents vary a little in different places.

Those who mention sea water differ in the accounts of its contents; all agree that it contains sea salt in large quantity, a calcareous earth, a bittern from which the sal catharticum amarum is prepared, and a proportion of an oily matter; to which many have added an unctuous, glutinous substance, and a bitumen; and others a sulphur from its putrefying.

But Dr. *Lucas*, who examined the sea water with care, denies that in general it contains any more unctuous or bitumenous matter, than any other common or salt spring; though he allows, that particular lakes and salt waters are impregnated with bitumen and other matters in particular parts of the globe; and he is certainly right, when he says, that putrefaction is no proof of a water's containing sulphur.

All the salts and earth, as they are found in sea water in a natural state, are fully saturated with the marine acid; and from the Epsom salt being prepared from the bittern, some people have suspected, that

this water contains likewise some of the vitriolic acid; but as none of those who have analysed sea water, mention their having got any portion of a true Glauber salt among its solid contents, we may conclude, that either sufficient experiments have not been made to discover this acid in sea water, or that there is none of it (at least in a fixed state) mixed with this water; or that the vitriolic acid of the sal catharticum amarum is either absorbed from the air, or that the natural acid of the bittern is changed into the vitriolic acid, by some latent process which is going forward while it is exposed to the air.

Some chymists have alledged, that sea water often contains likewise a portion of the nitrous acid; and in proof of this, Dr. *Newman*^a affirms, that he has sometimes (tho' not always) obtained an *aqua regia*, the menstruum of gold, and not a pure marine acid from sea salt; however, Dr. *Lucas* has fully demonstrated, that the sea water taken up at Harwich and at Tinmouth contained no such acid.

^a See the *Abridgment of Dr. Newman's Works* published by Dr. *Lewis*, § v. p. 250.

The quantity of solid contents in sea water is different in different climates; for the nearer the equator the more the sea is charged with salt, which seems to be owing to there being fewer rivers and less rain in the torrid zone, than in the colder climates; and the heat being greater, the evaporation of the watery particles is in proportion; and perhaps there may be larger salt mines at the bottom of the sea in the warm, than in the cold countries; but however that be, the difference is so great, that Dr. *Lucas* says, under the equator sea water contains one sixth or one seventh part, and in the Baltic only one thirtieth.

Cartheuser, in his *Rudimenta Hydrologiæ* ^b, tells us, that a pint of sea water taken up from the Mediterranean, yielded an ounce or $\frac{1}{16}$ of salt; and that an equal quantity taken up from the Baltic scarce afforded two drachms or $\frac{1}{64}$.

Dr. *Hales* got only $\frac{1}{27}$ from water taken up in the Mediterranean, and $\frac{1}{29}$ from water taken up at the Nore.

^b Sect. 33. Note (c) p. 49.

Dr. *Rutty* ^d says, he got $\frac{1}{25}$ from water taken up in latitude sixty-five; $\frac{1}{28}$ from water taken up near to Dublin; and $\frac{1}{30}$ from water taken up at Dungarvan.

And Dr. *Lucas*, that he got $\frac{1}{25}$ from sea water taken up at Harwich.

In evaporating sea water with a slow fire, a quantity of fine acid flies off with the watery vapour, and as this happens pellicles of a calcareous earth form on the surface of the water, which break and fall to the bottom; which, when encrusted there, are called the stony scratch.—The greater heat is used in evaporating the water, the greater quantity there is got of this earth.

When the evaporation is gone so far, that the water contains more than one fourth part of salt, the sea salt then concretes, and there remains a yellow oleaginous ley of the consistence of a syrup, which, after it will yield no more concrete salt, is called the bittern.

This bittern or ley, if evaporated to dryness, and exposed to the air, runs *per deliquium*. Dr. *Lucas* says, it entirely resembles

^d See his *Synopsis of mineral Waters*, book 3. chap. 2. p. 149.

the liquor called liquid shell, got by allowing the residuum left in the retort, after distilling the caustic spirit of sal ammoniac from the sal ammoniac and quicklime, to run *per deliquium*.

This bittern is an earthy neutral salt, mixed with the oily matter of the sea water.

If this bittern or ley, left after making salt, be conveyed into pits, and there let stand exposed to the air for months, it will shoot into chrystals, which are those of the *sal catharticum amarum*;—and if the water which remains be again boiled down, till a disposition to chrystallize is observed, more of this salt is obtained; and in this manner the salt may be allowed to chrystallize till all is got that is proper for use; and we are told, in the *Philosophical Transactions*, N^o 377. where this process is mentioned, that after the third boiling the liquor acquires a very pungent taste, seems altered in its properties, and will not yield any more of the chrystals of the *sal catharticum amarum*; but a salt which, when exposed to the air, runs *per deliquium*.

Dr. *Lucas*, who evaporated sea water taken up at Harwich, got in the proportion of four drachms, two scruples, and nineteen grains from a pint.

Of this he says, between eight and ten grains were a calcareous earth, which he separated by throwing the residuum into a filtre, when mixed with distilled water, which had dissolved its salts.

To judge of the quantity of bitter earthy salt which runs *per deliquium*, he exposed the dry solid contents of another parcel to the air, and found, that the contents of a pint increased near fifty-five grains in weight by the moisture they attracted. From hence I think we may conclude, that the quantity of bitter earthy salt is between thirty and forty grains.

He gives us no experiments by which we can determine the exact quantity of oily matter; but he says, it is certainly small, and he does not imagine it to be much more than is got from any common water.

Hence

Hence we see, that according to Dr. *Lucas's Analysis*,

	dr.	scr.	gr.
A pint of sea water at Harwich, } yields of solid contents — }	4	2	19
Which is composed of			
A calcareous earth from — —			8 to 10
Sea salt pure — — —	4		to 12 or more.
Bitter salt between — —			30 and 40
And a small quantity of an oily matter.			

Sea water was much used by the ancients, and has been in great repute of late years.

Externally applied it is a discutient, stimulating remedy, and has been used as such in bruises, œdematous swellings, scrophulous tumours, and a variety of other cases.—It is said likewise to have cured the itch, and to have been of use in other eruptive disorders.

As it is specifically heavier, and at the same time more stimulating than common water, it has for these reasons been found more efficacious when used as a bath to the whole body.

Taken internally, in small quantity, it proves a stimulating, heating remedy, dissipates the finer fluids, and increases thirst.

Taken

Taken in larger quantity, it proves purgative, but often at the same time increases and raises thirst.

What is remarkable of the use of sea water is, that patients often drink it daily for a considerable time in such quantity as to purge, and that instead of losing they gain strength by it; which is certainly owing to its not only acting as a purgative, to carry off impurities, but likewise to its giving a brisk stimulus to the stomach and intestines, and thereby increasing the appetite, and promoting digestion; and chalybeate waters, for the same reasons, are often taken daily without any diminution of the strength; whereas most of the common purgative medicines pall the appetite, dissolve the blood, at the same time that they make a large evacuation to weaken the body.

From our being able to keep up a purging for a considerable time, by the constant use of sea water, without hurting the constitution, we frequently remove disorders which have resisted the force of other remedies.

Dr. *Russel*, in his treatise on the use of sea water, says, that he found few glandular swellings

swellings which were not already tending to suppuration, which he had not been able to remove by the use of sea water. This perhaps is rather too general and too strong an assertion; for I have met with many on whom the salt water had no effect, though I have found it to be a remedy more serviceable in removing recent scrophulous swellings in the neck and lips, and scrophulous ophthalmia's, than most others in use, especially when joined to the use of the bark.

Sea water has likewise been found to be extremely serviceable in purging off gross humours which have been the consequences of indulging the appetite too freely, and leading too indolent and lazy a life, and in cleansing the intestines of viscid mucus and worms.

As sea water is a heating, stimulating remedy, it is found to do hurt where there is too much heat, fever, or inflammation; and therefore where patients have such symptoms, and at the same time other complaints which require the use of sea water, we must endeavour to cool the body by bleeding, purging, and the use of nitrous

trous and other antiphlogistic medicines, and a low diet before we give it.

Dr. *Rutty* says, that nothing more effectually prevents or cures the rot in sheep, than feeding them in the salt marshes which purges them; and that lean horses fed on pastures, washed by the spray of the sea, are first strongly purged, and then grow fat and recover.

S E C T. II.

SPRINGS WHICH ARE STRONGLY IMPREGNATED WITH SEA SALT.

THE next waters we proposed to consider, were those which yielded a large quantity of sea salt, and but a small proportion of other principles.

They are scarce ever used, except for the preparation of salt; and therefore I shall do no more than name two or three of them, and mention the quantity of salt they yield.

The water in the pits of *Barton* in Lancashire, and in several at *Northwich*, seem to be fully saturated with salt.

The

SALT SPRINGS. 113

The waters at *Droitwich*, *Upwich*, and *Middlewich*, contain one fourth of salt.

Some springs at *Northwich* and *Namptwich* yield about one sixth.

Those at *Weston*, in Staffordshire, only one ninth.

Many of these waters, besides the principles mentioned when we treated of sea water, seem to contain more or less of the vitriolic acid in a volatile, and sometimes in a fixed state, sometimes united to earths to form a calcareous Glauber salt, or a selenite; and at other times united to an ochreous or martial principle, and some of them have a foetid sulphureous smell, which goes off by boiling.

S E C T. III.

OF WEAKER SALT SPRINGS WHICH CONTAIN A CAL- CAREOUS GLAUBER SALT.

THE weaker salt waters, which have been drank for health, are many, and to be met with almost in every country;

they are commonly mixed with with more or less of the calcareous Glauber or Epsom salts.

The *calcareous Glauber salt* we mentioned formerly to be a salt composed of the vitriolic acid and a calcareous earth; and that there seems to be different species of it, according to the different sorts of earth with which the acid is united.—There are two sorts of this salt, which are most commonly to be met with in mineral waters; 1st. That which forms large chrystals resembling Glauber salt, with four, sometimes five, sometimes six parallelogram sides in the middle γ , which by many writers has been called nitre, and requires from ten to thirty times its own weight of water to dissolve it.—2dly. That sort called by the name of Epsom salt, which has a fine white earth for its basis, forms into small chrystals, and dissolves in nearly an equal weight of water.

All waters, which contain any of the species of the calcareous Glauber salt, become whitish and turbid on the mixture

† See Dr. Short's *Treatise on mineral Waters*.

of a pure alkaline salt, and afterwards precipitate an earth. They curdle with solutions of soap, and if the quantity of salt is not very small, they curdle milk when boiled with an equal quantity of it, as does the salt if boiled in the proportion of two drachms to a pint of milk. They redden beef and mutton infused or boiled in them, though not so much as salt-petre.

The salt of these waters melts and arises into blisters like alum, and their solutions have the same properties as the water.

Dr. *Rutty*^z says, that the large chrystallized calcareous Glauber salt inspissates the blood; whereas the Epsom salts render it more fluid and less tenacious.

The salt waters which have a mixture of this calcareous Glauber salt, and which we are now to consider, have a salt brackish taste, which is saltier or more brackish according to the proportions of sea salt, or of the calcareous Glauber and bittern they contain; and are known to be impregnated with these salts by proper experiments made with the waters, and with the sediments left after evaporating them.

^z See his *Methodical Synopsis*, book 2. ch. 3. § 1. p. 76.

It is very difficult to class properly the waters which contain both these salts, and to ascertain often which of them is most prevalent, as the experiments, related by authors, are not sufficient to determine the exact proportion of each salt; and what adds to the difficulty is, that the salts, when mixed and joined with other heterogeneous substances, have not always exactly the same properties as when single; as for example, sea salt in many of the sediments does not crackle and fly when put on a red-hot iron, as the pure salt is found to do. On account of these difficulties, it is probable that we may consider here several waters, which should have been brought into next class.

The waters which we are now to treat of, if given in small quantity, act as diuretics; in large quantity they prove purgative.

Some of them are strong, and a pint proves a strong purge to most people; while others of them are weaker, and require two, three, four, or six pints, to produce any such effect; and some are so

weak as scarce to act in this way without the addition of some purgative medicine.

Such waters are drank to free the blood of acrimonious humours, in scrophulous and scorbutic habits; to carry off leprous or other cutaneous disorders, to remove chronic obstructions, and in a variety of other cases. And they are likewise used as baths and fomentations in many cutaneous and other disorders.

As the virtues of these waters do not depend on volatile parts, but on fixed principles, we shall do little more than mention their solid contents, so far as taken notice of by authors, and the quantity in which they are drank.

118 BARROWDALE.

The waters which we shall consider under this head, are,

<i>ENGLISH.</i>	<i>GERMAN.</i>
BARROWDALE.	HORNHUSAN.
LEAMINGTON.	RATZEBURG.
ROUGHAM, OR NEW	CREUTZBURG.
CARTMALL.	
ST. ERASMUS.	
CARGYRLE.	<i>FRENCH.</i>
DORTSHILL.	D'AVAILLES.
	VEZALLAY.
<i>IRISH.</i>	ST. PIERRE DE CLER-
CARRICKFERGUS.	MONT.
KILROOT.	CHASTELGUYON.
MAHEREBERG.	
DUBLIN.	

BARROWDALE.

The spring, which affords this water, is situated three miles from Kefwick in Cumberland: it is more strongly impregnated with a marine salt than the water of the German ocean; a gallon affording, by evaporation, according to Dr. *Short's* account, eight ounces, or one sixteenth of solid contents; of which, he says, fix drachms are a light calcareous earth, the remaining seven ounces two drachms are sea salt. Dr.

Rutty,

Rutty, who has since made some experiments with the salt of this water, concludes, that it has a mixture of a calcareous Glauber salt, because it runs *per deliquium* in the open air; one half drachm of it boiled with a pint of milk curdled it; and the solution of the salt yielded a white cloud and a precipitate on being mixed with a pure alkaline salt.

Dr. *Short* tells us, that this water is a rough severe purge to strong constitutions, heats the body much, and excites thirst; but that, notwithstanding, it does not want its customers and admirers.

LEAMINGTON,

Situated near the RIVER LEAM in WARWICKSHIRE,

Is a weak salt spring, a gallon of which yielded, by evaporation, according to Dr. *Short's* ^a account, two ounces of solid contents, of which one half drachm was a calcareous earth, the remaining one ounce

^a See *History of mineral Waters*, vol. 2. p. 87, and 133.

120 NEW CARTMALL, &c.

and seven drachms were sea salt. By Dr. *Rutty's* experiments it should seem, that the salt has a mixture of a calcareous Glauber.

This water drank the length of two or three quarts, as it often is by the country people, purges and vomits strongly.

NEW CARTMALL, OR ROUGHAM, Situatèd in LANCASHIRE,

Is a weaker water of the same sort; a gallon yielded, by evaporation, according to Dr. *Short*^b, seven drachms and one scruple; of which one drachm and six grains were a *calcareous earth*, the other six drachms and fourteen grains, composed of five parts of a *marine salt*, and one part of a *calcareous Glauber*.

Dr. *Rutty*, who evaporated this water, alledges, that a gallon, on a medium, only yields five drachms, of which one sixth or one seventh is a calcareous earth, the rest a marine salt combined with a small portion of a calcareous Glauber salt, and of natron.

^b Ibid. p. 85, and 132.

ST. ERASMUS'S WELL. 121

This water, drank from three to eight quarts, operates powerfully by stool and by urine.

ST. ERASMUS'S WELL,

On Lord CHETWYND's grounds in STAFFORDSHIRE,

The water is of the colour of sack, without any eminent taste or smell. Dr. *Short* c says, a gallon, by evaporating, yielded five drachms of solid contents, of which four drachms thirty-two grains were sea salt, and twenty-eight grains an indissoluble matter, which he calls moss. Dr. *Rutty* says, the salt has a mixture of a small portion of calcareous Glauber salt.

CARGYRLE,

Situated in WALES, is about ten or twelve Miles from CHESTER.

The water is as clear as chrystal, and has been used as a purge. Dr. *Short* tells us, that a gallon of this water yields, by

^c Vol. 2. p. 133.

evaporation,

122 DORTSHILL, &c.

evaporation, three drachms and two scruples of sediment, of which one drachm and six grains, are a calcareous earth, the other two drachms, thirty-four grains, a marine salt, which Dr. *Rutty* says has a mixture of a small portion of a calcareous Glauber salt.

DORTSHILL,

IN STAFFORDSHIRE, six miles from
LITCHFIELD,

Yields from a gallon, four drachms of sediment composed of sea salt, a calcareous earth, and a bittern ^d.

IRISH SALT SPRINGS.

The account of the Irish waters, we shall consider under this head, is taken from Dr. *Rutty's Synopsis*.

CARRICKFERGUS,

IN the county of ANTRIM in IRELAND,

Is a salt water which, by evaporation, yields of solid contents two ounces thirty-six grains, which is mostly made up of sea salt, with a very considerable portion of an

^d See Dr. *Short's Treatise* in 8vo. published in 1765.

insoluble

K I L R O O T.

123

insoluble matter, and but a small quantity of a calcareous Glauber salt.

When the hydrometer stood at 50 in distilled water, it stood at $0\frac{3}{5}$ in this.

K I L R O O T,

Situated likewise in the county of ANTRIM,

Is a salt water of which a gallon yielded six drachms and two scruples of a white sediment by evaporation; of this there is a very considerable quantity of indissoluble matter: the rest is principally sea salt, but with a larger proportion of calcareous Glauber than the former.

Three pints and a gill gave the Doctor four stools in less than two hours.

M A H E R E B E R G,

Near BRANDEN BAY in the county of
K E R Y,

Dr. *Rutty* says, is a salt water, from which Mr. *Smith* obtained, by evaporation, in the proportion of one ounce one drachm and one scruple of sediment; most of which is sea salt, but seems to have a greater proportion of a calcareous Glauber salt than either of the two last named waters.

124 DUBLIN SPRINGS.

It is a purgative of considerable strength ; the dose is from a pint to a quart. The hydrometer stood, in distilled water, at 50, in this at 10.

DUBLIN SALT SPRINGS.

Dr. *Rutty* mentions six weak salt springs which are in Dublin, five in *Francis Street*, and one in *Thomas's Court* ; the solid contents of which, obtained by evaporation, were mostly a sea salt mixed with a calcareous Glauber (the proportion of which he does not mention) and a small quantity of an indissoluble matter.

All these waters have a brackish taste, and fermented with both the milder and the stronger acids ; but whether this is owing to their containing a volatile vitriolic acid, and a mineral spirit, or to their containing a natron or calcareous earth, is not particularly mentioned ; though Dr. *Rutty* seems to think it entirely depends on their containing a quantity of a calcareous earth.

The hydrometer stood in them from $2\frac{1}{5}$ to $2\frac{3}{5}$.

The

DUBLIN SPRINGS. 125

The Dublin waters contained of solid contents the following quantity in a gallon :

Five springs in Francis Street.

	gr.		oun.	dr.	scr.	gr.
1st. At the Burn's Arms con- tained, — — — }	584	or	1	1	2	4
2d. At the Pump, — — —	431	or	—	7	—	11
3d. At the Vernon's Head, — — —	437	or	—	7	—	17
4th. At the Plough, — — —	410	or	—	6	2	10
5th. At the Wheatſheaf, — — —	368	or	—	6	—	6
6th. In Thomas's Court, — — —	316	or	—	5	—	16]

The earth in the ſediment of the ſpring at the Burn's Arms was at different trials about one fifteenth.

In the pump water from one ſeventh to one ſixteenth.

In the Wheatſheaf only one fifth.

In Thomas's Court one thirteenth.

In diſtilling the Burn's Arms water, the firſt water that came over was pure without mixture ; but the laſt runnings, Dr. *Rutty* ſays, were acid, curdled ſoap, and had a ſmell like ſpirit of nitre ; but in diſtilling the Thomas's Court water it was void of all acidity from firſt to laſt.

He ſays, all theſe waters are of a purgative nature ; and drank from two to fix
pints,

pints, they give five or six stools without occasioning gripes.

GERMAN SALT SPRINGS,

With a portion of a calcareous Glauber.

There are a great many salt springs in Germany, many of which ought perhaps to be placed here; Dr. *Hoffman* mentions two which contain sea salt and a portion of a calcareous Glauber salt, but has given no particular account of either; but says, they are in great repute in Germany; the two are *Hornhusan* and *Ratzeburg* or *Rasburg*.

H O R N H U S A N,

In the principality of HALBERSTADT, in the district of OSCHERTZLEBEN, six miles from SCHOENBECK,

Was much frequented last century; Dr. *Rieger*^c says, it contains nothing but com-

^c See Dr. *Rieger's* *Introd. in Notitiam, &c. Art. de Acidules.*

mon *salt*, and another *salt* like the *arcanum duplicanum*, but a larger proportion of the first; drank to three or four pints, it purges powerfully, and is reckoned useful for evacuating worms and cleansing the first passages.

RATZEBURG, OR RASBURG,

In the county of MAGDEBURG, not far from the town of STASFURTH,

Is a water which, Dr. *Rieger* says, contains nothing but salt, and therefore agrees with the Hornhusan water.

CREUTZBURG,

A brine spring near to CREUTZBURG,

Which, Dr. *Rutty* says, contains, besides a marine *salt*, a bitter purging salt of the nature of the Epsom.

This water has been recommended for the cure of intermittents, where the Bark has had no effect.

FRENCH SALINE WATERS,

With a calcareous Glauber.

D'AVAILLES.

The waters of d'Availles in the Poictou, *De Clos* says, contain about four drachms twenty-seven grains of salt in the gallon, which is mostly sea salt, with a mixture of a calcareous Glauber.

VEZELLAY.

The water at Vezellay in Burgundy, Mr. *Lemery* (in the *Memoirs of the Academy of Sciences for the year 1705, hist. p. 34.*) says, contain about four drachms and four grains of a grey salt like the marine in the gallon; and that it is mixed with a little grey earth, and seems to have a mixture of a small proportion of a calcareous Glauber salt.

ST. PIERRE DE CLERMONT,

This water situated in the Auvergne; *De Clos* says, was limpid, had somewhat
of

of an acid or vinous taste, and had deposited a white sediment when brought to Paris.

In evaporating there formed a white pellicle which precipitated, and there were a number of flocculi observed swimming in the water. After evaporating all the water, there remained of sediment $\frac{1}{240}$ part of the whole, which is in the proportion of two hundred and fifty-six grains from the gallon; of this one half was like to that portion of *sea salt* which goes into crystals in the cold and moisture, and which curdles with a solution of fixt alkalies in water; the rest was earth, and dissolved with a great effervescence in distilled wine vinegar, and contracted a saltiness, and turned of a grey colour by the force of fire.

CHASTELGUYON.

Du Clos says, it was limpid, had a subacid and somewhat vinous taste, and had deposited a white earth when brought to Paris.

In evaporating it threw up a pellicle which precipitated in form of scales or plates.

The sediment was $\frac{1}{17\frac{1}{2}}$ part of the whole, or $357\frac{1}{4}$ grains in the gallon, and was partly earth and partly salt. The saline matter was nearly of the same nature with that portion of sea salt, which curdles with a solution of salt of tartar, and is not to be condensed in cold or moisture. The earth partly dissolved in vinegar, and by the force of fire it changed to a yellow colour, and shewed that it contained likewise some salt.

S W I T Z.

S C H U L S,

in RHOETIA.

Near this place are two salt springs ^f, the one of which is pure, the other turbid, and both are purgative.—It is probable, that if these waters were analysed, they would be found to contain a portion of a calcareous Glauber salt.

^f See Gruner's *Account of the Icy Mountain of Switzerland*.

C H A P. VI.

OF WATERS WHICH CONTAIN A CALCAREOUS GLAUBER SALT, WITH A PORTION OF SEA SALT.

THE waters which we are now to consider, are those where the calcareous Glauber *salt* is in greater quantity than the sea salt, though it is difficult often to determine which of the two is most prevalent. They are more purgative, in proportion to the quantity of salts they contain, than those of the last class; their virtues depend likewise on their fixed principles; and therefore we shall do little more than mention the quantity and quality of their solid contents, so far as is ascertained by authors.

Those we shall consider at present, are,

E N G L I S H.

ALFORD.	KINALTON..
DULWICH.	SYDENHAM.
HOLT.	MORETON.
STRETHAM.	COMNER.
DOG AND DUCK.	PANCRAS.

BARNET AND NORTH

HALL.

ACTON.

EPSOM.

ALKERTON.

BALL, or BANDWELL.

LLANDRINDOD.

KENSINGTON.

RICHMOND.

COLCHESTER.

BRENTWOOD.

UPMINSTER.

IRISH.

CARRICKFERGUS.

GERMAN.

SEDLITZ.

SEYDSCHUTZ.

HUNGARIAN.

NEOSOL.

CHEMNITZ.

ALFORD, OR AWFORD,

In the county of SOMERSET, about
eighteen miles southward of BATH.

Guidot says, this is a strong purging water, which used to be drank for that purpose at Bath, and that he got six drachms of solid contents, from a gallon, by evaporation; but *Dr. Ratty* tells us, that he was able to obtain only two drachms from the same quantity. He says, one scruple of this was a calcareous earth, the other five scruples a salt; two thirds of which were a calcareous Glauber *salt*, and the other third sea salt.

Dr.

Dr. *Rutty* observes, that this water did not curdle milk, though its salt did.

The hydrometer stood in it at $3\frac{2}{5}$.

D U L W I C H,

Situated five miles from LONDON, in the county of KENT,

This is a weak purging water.

It is clear, obscurely brackish, and a little bitter in the throat.

Evaporated, Dr. *Rutty* obtained three drachms of sediment from a gallon of one specimen, and only two drachms from the like quantity of another g; which, he says, by washing, filtrating, and chrySTALLIZING, appears to be made up of a calcareous Glauber and sea salt, and a little calcareous earth. He does not mention the exact proportions of each; but seems to think, that the sea salt is rather predominant.

§ Dr. *Rutty* mentions a Dr. *Soame*, who alledged he got a much larger quantity of solid contents, viz. ten drachms, two scruples from a gallon of the water. See his *Synopsis*, book iii. chap. 3. Note to p. 170.

It is drank from three to eight or nine pints.

There is a new spring nearer London, which seems to contain more of the calcareous Glauber salt; of this Dr. *Martin* says, five half pints purge quickly.

H O L T,

Near BRADFORD in WILTSHIRE,

Is a limpid water, which has little taste as taken up from the fountain.

By evaporation, Dr. *Rutty* says, a gallon yielded one hundred and seventy-six grains, or two drachms, two scruples, and sixteen grains of sediment, which contained a large proportion of calcareous earth; in one trial it was as forty to seventy-seven, in another half and half; in evaporating the water, it threw up a calcareous scum: the earth, though it fermented with oil of vitriol, yet it scarce acquired the taste of lime by being calcined twelve hours.

The salt is mostly a calcareous Glauber, and in some trials cubical chrystals were obtained.

From the great quantity of earth and the small quantity of salt this water contains,

it rather proves alterative and diuretic than purgative; however two quarts operate sensibly by stool.

S T R E T H A M,

In the county of SURRY, near to LONDON,

Is a mild purging water, which yields by evaporation (according to Dr. *Rutty's* account) about two hundred grains or three drachms, one scruple from a gallon.

The water curdles with soap, curdles milk boiled with equal parts of it, and gives beef steeped in it a pale-red colour.—In evaporating it throws up a calcareous scum.

The residuum of two hundred grains contained about one fifth or forty grains of a calcareous earth; the other four fifths, or one hundred and sixty grains were salt, which, on being chrySTALLIZED, afforded chrySTALS partly of sea salt, partly of a calcareous Glauber.

It may be drank to three pints or more.

D O G A N D D U C K,

Situated in S T. G E O R G E ' S F I E L D S,
L A M B E T H, in the county of
S U R R E Y.

This water is clear, and has very little taste: it is a very weak purging water.

Authors differ much with respect to the quantity of solid contents they have obtained, by evaporation, from this water.

Dr. *Hales*, in the Philosophical Transactions, N^o 495, says, he got three hundred and twenty-four grains from a gallon. Dr. *Rutty* at Dublin got only ninety-six; and he tells us that Dr. *Fothergill* in London got two hundred.

Dr. *Rutty* says, that only about one twelfth is an indissoluble matter, which fermented with acids, but did not become a perfect lime by calcination,

The salt is composed of sea salt and a calcareous Glauber, in which Dr. *Rutty* thinks the marine salt is prevalent.

This

This water, drank to three pints, purges; though it is so weak, that some people take a small quantity of some purging salt to quicken its operation.

Dr. *Fothergill*^h observes, that this water has acquired reputation in the cure of most cutaneous disorders, and in scrophulous cases; and it has been found of use for keeping the body cool, and preventing the return of cancerous diseases. He says, it may be given freely to young strong people; but that to persons advanced in years, it rather cools and relaxes too much, and is apt to bring on, or to increase the fluor albus in weakly women. It is a mild cooling laxative water to children, and people who have weak bowels; but after using two or three times, it seldom acts by stool without the assistance of salts, or some other opening medicine. It is often used with success as a mild cooling alterative and diuretic.

^h See Dr. Rutton's *Synopsis*, p. 168.

K I N A L T O N W A T E R ,

Situated near to the village of KINALTON,
in NOTTINGHAMSHIRE,

Is a clear faltish tasted water, which operates as a purgative, when drank plentifully.

Dr. *Rutty* says, that, by evaporation, a gallon yields about two hundred and eight grains of sediment; whereof about one fourth (or fifty-two grains) was a beautiful white alkaline earth, the rest a remarkable pure and clean calcareous Glauber salt, which dissolved in about twenty-four times its own weight of distilled water.

S Y D E N H A M ,

In the county of KENT, near LONDON,

Is a mild purgative water; of which a gallon yields by evaporation, according to Dr. *Rutty's* account, two hundred and forty-eight grains, or four drachms, eight grains; of this one eleventh, or twenty-two

M O R E T O N - S E E. 139

two and a half grains, were a calcareous earth ; the remaining three drachms, two scruples, six and an half grains were salt, composed of a calcareous Glauber and sea salt, but in which the calcareous Glauber was predominant.

The hydrometer stood at 3. 0. in it.

M O R E T O N - S E E,

Situated two miles from MARKET DRAYTON in SHROPSHIRE.

This is a mild purging water. Evaporated, Dr. *Short* says, a gallon yielded two hundred and seventy-seven grains, or four drachms, one scruple, seventeen grains ; of which seventy-six grains, or one drachm, sixteen grains, were a calcareous earth ; the other two hundred and one grains, or three drachms, twenty-one grains, a calcareous Glauber salt.

Dr. *Short* ⁱ says, it is an excellent cooling and diuretic purge, operates very strongly, and is the only one in these parts.

ⁱ See *Short on Mineral Waters*, vol. ii. p. 81, and 133.

H A N L Y S,

Situated within two miles and a half of the town of SHREWSBURY, in SHROPSHIRE.

Dr. *D. Wessel Linden*, in the year 1768, published a history and analysis of these waters : he says, the purging water springs up with impetuosity, and is perfectly clear and limpid, and has a saline bitter taste, which is not at all disagreeable. It does not change its colour, when exposed to the air, nor does it lose its purgative quality.

Twenty-five ounces, evaporated, yielded one hundred and sixty grains of sediment, which is in the proportion of eight hundred and nineteen, and one fifth, from a gallon. Three fourths, or one hundred and twenty grains, of this sediment were a small-grained purging salt, like that got from the Sedlitz water in Bohemia ; the other fourth, or forty grains, was an insoluble earth.

Four half pints taken gradually in the morning, on an empty stomach, is in general

ral sufficient to purge those of strong habits, and two or three those of weak.

COMNER, OR CUMNER,

In BERKSHIRE, is four miles west of
OXFORD.

This water is always of a whitish colour, especially in summer; but it is clearer in winter.

Dr. *Short*^k evaporated it, and got two hundred and ninety-six grains, or four drachms, two scruples, sixteen grains of sediment, from a gallon; of which fifty-two grains were lime-stone; the other two hundred forty-four grains a calcareous Glauber salt, which Dr. *Rutty* says, has either a mixture of natron, or borders more on the alkaline than most of the calcareous Glauber salts of other waters. Dr. *Short* says, the dose to purge rustics is from a quart to two or three.

^k See *Short* on *Mineral Waters*, vol. ii. p. 80. and 133.

P A N C R A S,

In the county of MIDDLESEX, near
LONDON,

Is a mild purgative water; at the fountain it is clear, and has scarce any taste.

Evaporated, a gallon yielded three hundred grains, or five drachms, of solid matter; of which about $\frac{1}{21}$ part, or near ten grains, was an indissoluble matter; the remaining two hundred and ninety grains, a salt, mostly a calcareous Glauber, with a small mixture of sea salt.

B A G N I G G E.

About a mile south-east from PANCRAS, and a little east of the FOUNDLING-HOSPITAL, at the bottom of the rising ground on which ISLINGTON stands, is BAGNIGGE-WELLS.

The purging water here is a good deal of the same nature as the Pancras and Acton waters.

Dr.

BARNET AND NORTH HALL. 143

Dr. *Bevis* ¹ evaporated them, and from a gallon got three hundred and ninety-two grains of solid contents.

Two hundred and fifty-seven grains were sea salt, and a bitter purging salt, so blended, that he could not distinguish what proportion these salts bore to one another; and one hundred and thirty-five grains were an insoluble calcareous earth.

Three half pints of this water purge most people, without the assistance of any artificial salt.

Just by the purging water is a saline chalybeate water, which we shall take notice of in its proper place.

BARNET AND NORTH HALL,

Both in HERTFORDSHIRE.

It has been alledged by some people that they are the same water; but they are got from two different springs, situated at a distance from each other.

¹ See Dr. *Bevis's Experimental Enquiry into the Contents and Qualities of these Waters*, published at London 1760.

Dr.

Dr. *Rutty* analysed both at Dublin: he says, the *Barnet* water tasted strongest, and a gallon yielded five drachms, twenty-three grains of sediment; of which a little more than twenty-six grains were an indissoluble matter of the calcareous kind; the other five drachms, two grains, a saline matter, mostly a calcareous Glauber, with a small mixture of sea salt.

The *North Hall* yielded, on evaporation, four drachms, ten grains of a white sediment; of which twenty-five grains were a calcareous earth; the remaining saline matter of the same nature as the salt of the *Barnet* water.

A C T O N,

Near L O N D O N, in the county of
M I D D L E S E X.

This water is clear, without any smell, and has a little of a bitterish taste, somewhat like to a very weak solution of the sal catharticum amarum. I examined this water at the fountain; it was extremely clear and limpid;

pid. The bottom and sides of the well seemed covered with a brown ochreous-like sediment; but a tincture of galls gave no shade of red or purple; though, on first mixing, it gave a slight blueish tinge, but so little as scarce to be discerned. After being kept three days, it had a slight foetid smell, and a number of white flakes were observed floating in it. It was nearly of the same weight as New River water.

Evaporated, Dr. *Rutty* says, a gallon yielded three hundred and forty-four grains, or five drachms, two scruples, four grains, of a very white or nauseously bitter sediment; of this near nineteen grains were an earth, which was not reduced to lime by an hour's calcination in an open fire; and although it made an ebullition with oil of vitriol, yet vinegar had no effect on it. This earth is said to afford a rhomboidal talc.

The saline matter, which was three hundred and twenty-one grains, is mostly a calcareous Glauber salt, which requires a stronger heat, to make it rise into blisters, than the common salts of this kind. The crystals of this salt are long striæ, like needles, and the sides of them are evident parallelograms. The salt is entirely dissolved

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solved in about forty-eight times its own weight of distilled water.

Dr. *Rutty* says, the chrystals, kept in a close vessel, retained their firmness for many years; which shews that the calcareous Glauber salt predominates over the marine salt; but he does not mention its having yielded any cubic chrystals.

The Acton is reckoned among the strongest of the common purging waters about London, and, like other such waters, occasions a forenens about the fundament.

The hydrometer stood in it at 3. 0.

E P S O M,

Situated in the county of SURREY, about seventeen miles from LONDON.

The Epfom water was the first purging water from which the bitter purging salt was prepared; and from thence is one of the most noted waters of this class in Europe.

It is colourless and pellucid, and has no smell, and but a slight saline taste.

Authors differ with respect to the quantity of solid contents in this water. *Lister* tells us, that a gallon yielded, by
evapo-

evaporation, an ounce and a half. Dr. *Rutty* says, he only got an ounce ; and that in some wet seasons it did not yield half that quantity.—And Dr. *Lucas*, in evaporating this water, got *only* five drachms and a scruple.

According to *Allen*, this sediment consists of eight parts of salt, and one of earth, or indissoluble matter. Dr. *Rutty* says, that in his trials of the water, it yielded a much less proportion of earth ; and Dr. *Lucas*, that five parts are salt, and one earth.

All who have made experiments with the salt agree, that it is mostly a calcareous Glauber. Dr. *Rutty* says, one part is a marine salt, and nineteen parts are a calcareous Glauber salt, which requires at least twenty-four times its own weight of distilled water to dissolve it intirely ; though the salt which is commonly sold for Epsom salt, readily dissolves in little more than equal parts of water ; and it even runs per deliquium when exposed to the air.

Dr. *Lucas* says, if the solution of the salt be evaporated to a pellicle, it yields a salt whose chrystals correspond with Glau-

ber falt, and there remains a bitter that will not chryftallize.

The earth appears, from Dr. *Rutty's* experiments, to be of the calcareous kind.

This water is drank from one to three pints in the fpace of two or three hours, when it is ufed as a purge; and Dr. *Lucas* tells us, that it is a mild alterative, if drank to a pint divided into three dofes in the day.

Dr. *Rutty* fays, when the hydrometer flood at $10\frac{1}{3}$ in diftilled water, it flood at $5\frac{3}{5}$ in this.

A L K E R T O N,

In the county of GLOUCESTER, between the town of GLOUCESTER and PETTY FRANCE,

Is a purging water, which Dr. *Short* evaporated, and got feven hundred and fifty-two grains from a gallon; fixty-four of which were a calcareous earth, fix hundred and eighty-eight grains a faline matter, moftly a calcareous Glauber falt, but with a little mixture of fea falt.

The

BALL, OR BANDWELL. 149

The Doctor in the same treatise, published in 1765, tells us, that he met with three purging waters of the same kind in this county: 1. One at Tewkesbury: 2. One in Walton grounds: 3. And one in Teddington grounds. They were not above a mile's distance from each other.

BALL, OR BANDWELL,

At STENFIELD in LINCOLNSHIRE,

Is a water called Ball, or Bandwell, a gallon of which evaporated, Dr. *Short* m says, left four scruples of white sediment; forty-four grains whereof were earth, and about thirty grains a calcareous Glauber, and eight grains a marine salt.

LLANDRINDOD.

In the parish of LLANDRINDOD, in the county of RADNOR, in SOUTH WALES,

Is a water mentioned by Dr. *Wessel Linden*, under the name of *the saline purging*,

^m *Hist. of Mineral Waters, &c.* 4to. vol. i. p. 107.

which, if properly examined, perhaps should be ranked in this class; but his account is so indistinct, that it is not easy to say to what class it should belong.

At the place it is called the *Pump Water*, and is recommended for the cure of many disorders.

It is ordered to be drank to about three pints in the day, as an alterative: a pint and an half in the morning, before breakfast, taken at three draughts, leaving a quarter of an hour's distance between each half pint: the other pint and an half at three draughts likewise;—one an hour before dinner, another about six o'clock in the evening, and a third at going to bed. But if the body remains costive, the quantity must be increased.

It may be used as a purge twice a week; when it ought to be drank at the fountain head, by half pints, till it begins to operate, the patient walking or riding about between each draught.

There is likewise in the same parish both a strong chalybeate and a strong sulphureous water.

Dr.

Dr. *Benjamin Allen*, in his *Natural History of the chalybeate and purging waters of England*, mentions several purging waters, which he has not described so particularly as to determine in which of the above classes they ought to be put or ranged; such as,

One at Kensington, in the county of Middlesex.

One at Richmond, in Surry.

One at Colchester, from the north	} Effex.
end, - - -	
One at Brentwood, -	
And one at Upminster, -	

IRISH WATERS.

CARRICKFERGUS,

Situated in the suburbs of the town of CARRICKFERGUS, in the county of ANTRIM.

At this place there are two springs; the one we have mentioned formerly under the head of salt springs; but the other, in

K 4
which

which the calcareous Glauber salt is prevalent, is now to be considered.

This spring yields a weak purging water, which has a blueish colour, and a very soft taste at the fountain head.

Evaporated, Dr. *Rutty* got one hundred and thirty-two grains, or two drachms, twelve grains of sediment from a gallon of the water; of this, he says, twenty-four grains, or between one sixth and one seventh, was a calcareous earth; the remaining hundred and eight grains a salt mostly of the calcareous Glauber kind, which the Doctor says has a small proportion of sea salt mixed with it, and he adds, a little sulphur; but brings no proof of its containing more than an oily matter common to all waters.

This water is drank the length of five or six pints.

GERMAN WATERS.

SEDLITZ,

At the village of SEDLITZ, in BOHEMIA,

Is a noted purging water, which was brought into repute by Dr. *Hoffman*ⁿ; by whose account it appears that it is a water of the same nature as the Epsom, but much stronger, a gallon yielding above two ounces of the bitter purging salt; for a medical pound yielded two drachms and some grains of this salt.

This water proves purgative, and two or three cupfuls are generally sufficient for a dose, the strongest constitutions scarce requiring more than a pint.

ⁿ *Hoffman de fonte & sale Sedlicensi Oper. tom. v. p. 186, &c.* He says, a medical pound yielded two drachms and some grains. He makes a comparison between this and the Epsom salt, where he says, that the Sedlitz salt is not so transparent, does not run so easily per deliquium, and is bitterer than the Epsom; and that an ounce of common water dissolves only an ounce of the Epsom, but an ounce and two scruples of the Sedlitz salt.

SEYD-

S E Y D S C H U T Z.

Hoffman mentions another spring of the same nature, which is likewise situated in the county of SEDLITZ, near to the other, but a little higher; the water of which is a little stronger; for a medical pound yielded, by evaporation, two drachms and ten grains of the same sort of salt, and six grains of a calcareous earth.

H U N G A R I A N.

NEOSOL AND CHEMNITZ.

Dr. *Hoffman* likewise tells us, that Dr. *Herman* obtained a salt, nearly of the same kind as the Epsom or Sedlitz, from the waters of the mines of Neosol and Chemnitz in Hungary.

C H A P. VII.

OF WATERS CONTAINING
A CALCAREOUS GLAUBER
SALT.

GERMAN.		SIBERIAN.
CEICIENIAN LAKE.		TUSTUKUL.

CEICIENIAN LAKE.

DR. Thomas Jordan, in his *Account of the medicinal Waters of Moravia*, published in 1586^o, tells us, that on an estate of the Marshal of Bohemia, D. Czenkius of Lippa, in the Hodonian district, is a lake or pool about fifteen hundred paces long and nine hundred broad, and about five or six feet deep, which has no visible ingress or egress of water; and that the water of this lake is extremely bitter, more so than even wormwood or bile; it is not quite limpid, but has some-

* *This Treatise de aquis medicatis Moraviæ, published in the year 1586, by Dr. Thomas Jordan, is one of the most accurate and distinct accounts of mineral waters wrote in that century, or even till towards the end of the last.*

thing

thing of a greenish, yellowish colour; and there is a thick foetid black mud at the bottom.

There is no fish in this lake, though, at at certain seasons of the year, a number of wild duck, wild geese, and other water fowl resort thither.

On evaporating this water, Dr. *Jordan* found the sediment to be a pure nitre unmixed with any other substance; and he obtained two ounces of nitre from six pounds of the water.

What Dr. *Jordan* calls nitre here, is certainly either a true or a calcareous Glauber salt, or an Epsom salt, or a natron; and the proportion he got from this water, is much larger than what has been got from any other we have an account of.

It is to be wished, that we had still a more accurate analysis of this water, that we might know more exactly the nature of the salt, and whether the water contained any other salt, or an earthy or a bitumenous matter besides this salt, which Dr. *Jordan* calls nitre.

S I B E R I A N.

LAKE OF TUSTUKUL.

In the second volume of the *Comment. de rebus gestis in Scient. Nat. & Medicina*, p. 490. we are told, that Dr. J. G. Gmelius, in his travels through Siberia, mentions, that near the river Zagan Ius there is a salt lake, called Tuftukül, whose water in summer concretes into chrystals, not cubic, resembling sea salt, but of the figure of those of nitre.—And near to the banks of this lake is a water which resembles the Seltzer in taste.

C L A S S II.

C O L D W A T E R S.

WATERS WHICH CONTAIN A FOSSIL
OIL OR SULPHUR.

C H A P. I.

OF WATERS WHICH CONTAIN
A FOSSIL OIL.

WE formerly mentioned, that all waters, even those esteemed the most pure, contain an oily matter, but in general it is in such small quantity as not to be perceptible by our senses, and is only to be discovered by evaporating the water and finding marks of its being mixed with the solid contents that are left. At present we shall only consider those waters in which an oily matter is to be found in a large quantity.

Though

Though fossil oils have long been known and used for medicinal purposes, yet the waters in which they have been found have not hitherto been introduced into practice, neither have they been analysed with care, to know whether any of the oils are incorporated with the waters, or what other principles the waters contain; and therefore I shall do little more than mention some of the springs which afford these oils, and the nature of the oil itself.

Fossil oils, as we before observed, have been called Naphtha, Petroleum, Pissellæum, Pisasphaltum, &c. according as they are more or less pure.

These oils, especially the finer sorts, are extremely volatile and send out a vapour which very readily takes fire; and hence, when a candle is brought near any of the wells which afford them, this vapour catches flame and will burn, like spirits in a lamp, for a longer or a shorter time as the spring affords a greater or less supply to feed the flame; and some fountains emit such fine inflammable vapours, although no fossil oil is found floating in their waters.

160 OF WATERS, &c.

The springs which afford the fossil oils,
which we shall at present take notice of,
are,

ITALIAN.

MODENA.

BONONIA.

PERSIAN.

BACKU.

SUMATRAN.

East end of the Island.

TRANSILV.

MEGIERS.

HERMANSTADT.

POLISH.

CRAKOW.

GERMAN.

WALDSBORN.

ENGLISH.

PITCHFORD.

BROSELY.

WIGAN.

SCOTTISH.

LIBERTON.

SWITZ.

VALTALINE.

DIEMTIGEN.

WEST-INDIAN.

BARBADOES.

FRENCH.

GABIAN.

PLOMBIERES.

FLEMISH.

DOUAY.

ITALIAN.

I T A L I A N.

M O D E N A,

About twelve miles from the town of
M O D E N A, towards the A P E N N I N E
mountains,

Is a small town or village called Mon-
zibius or Mount Gibius; in the neighbour-
hood of which are mountains where there
are springs which yield a fine fossil oil.

Ramazini mentions several.

1st. The spring which yields the finest is
situated on Mount Festin.—The petroleum
or Naphtha issues from a flinty rock, mixed
with water, from which it is easily separated.
It is often extremely pure and white.—He
observes, that the fine subtile penetrating
vapour of this oil is said to cause a difficulty
of breathing, and to occasion a sharp pain
in the ears of the people who go down
into the well to gather it; and that they
are sometimes suffocated with the steams.

2d. On Mount Gibius are three springs;
the water, in which these oils swim, is of a

white, and the oil in one well is transparent and of a reddish-brown colour, and in another it is blackish; their steams are apt to affect people with the head-ach who stand long near the wells.

B O N O N I A.

In the mountains between Bononia and Florence, *Baccius* tells us, there is a cold spring which catches fire at the approach of a lighted candle.

B A C K U,

Situated on the borders of the CASPIAN sea in the PERSIAN dominions,

Has many fountains in which a petroleum of a yellow colour is found floating on the surface; Mr. *Bell*, in his travels p, says, the Persians burn it in their lamps for oil.

ISLAND OF SAMATRA.

In the east end of this island, opposite to the island of Java, are springs which

p See his *Journey to Persia*.

yield

yield a fine sort of naphtha or petroleum, which *Bontius* [¶] says, the natives use in paralytic cases, and esteem so much, as to prohibit the exportation of it under the pain of death.

MEGIERS AND HERMANSTADT,

In the country of TRANSILVANIA,

Are two springs of limpid cold water which flame at the approach of a candle; the one is in the district of Megiers, near the Danube; the other at a place called Hermanstadt, an inland town.

P O L I S H.

C R A C K O W.

In the Palatinate of CRACKOW in LESSER POLAND,

Is a limpid fragrant water, which has a soft taste, and emits an inflammable vapour which burns when a candle is brought near the well.

[¶] *De Medicina Indor. de Method Medend. cap. 1.*

By evaporation it yields a blackish bitumen.

Sir *Christopher Meighan*, in his *Account of the Bareges Waters*, p. 49. tells us, that in Podolia ^r, about the city of Camineck, petroleum runs in streams from the rocks, and is depurated by perfumers to be vended for medicinal purpose—that in the palatinate of Russia the people dig pits to receive distillations of waters charged with a viscid tar-like matter, serviceable for greasing wheels and other machines, and it is likewise in vogue against all pestilential diseases—and that near the village of Rungury is one lake between hills, and others in the mountainous country of Ropeuka, which are constantly covered with this oily matter, which the inhabitants use for softening leather, and for the cure of the mange in cattle; and think it likewise salutary to themselves against disorders of the stomach and other complaints.

^r This account is inserted in the new edition of this work, published at London 1764; and is taken from *Anhon. Gab. Rzaczynsk. Hist. nat. curios. Poloniæ*, p. 119.

E N G L I S H.

PITCHFORD in SHROPSHIRE,

Is a well which yields a thick black mineral oil of the nature of Barbadoes tar. The country, in the neighbourhood, is full of coal mines.

B R O S E L Y,

Situated near WENLOCK in SHROPSHIRE.

This water flames and burns very brisk, like spirits in a lamp, when a candle is brought near it. This flame will boil a tea-kettle; tho' the water in the well is not sensibly heated thereby, for it feels as cold as if no fire had been there, so soon as the flame is extinguished.

W I G A N in LANCASHIRE.

At Aucliff, two miles from this place, is a well of the same kind, which takes flame and burns in the same manner; and

it even does so after the water is all drained out of the well, and a candle is held near the surface of the earth, which shews from whence this bitumenous vapour arises.

SCOTCH.

LIBERTON,

In the county of MIDLOTHIAN in SCOTLAND.

Near this village is a well called St. Katherine's Well, in which is found a fossil oil of the nature as the Barbadoes tar; it is surrounded with coal mines.

SWITZ.

VALTALINE,

Subject to the GRISON in SWITZERLAND.

Varenius says, there are springs of petroleum here..

DIEMTIGEN,

In the lower valley of SIMEA, in the
county of BERN.

Near this place rises up an oily spring,
called by the inhabitants *Unschlitbrunnin*, or
Tallow-Well ^s. Its water is insipid, but it
deposits to the sides of the vessels in which
it is kept, a fat white, and often reddish
matter, which in a short time acquires the
smell of putrid flesh.

BARBADOES,

In the island of BARBADOES, in the
WEST-INDIES,

Is found a coarser sort of fossil oil, called
Barbadoes Tar.

^s See in the 3d part of the 1st Supplement to the *Comment
de rebus gestis in Scientia naturali & Medicina*, an ex-
tract from Monf. Gottlieb. Sigm. Gruner's *Account of the
icy mountains in Switserland, published in the German
language at Berlin, 1760.*

F R E N C H.

G A B I A N,

In the road between MONTPELIER and
BEZIER, in the province of LANGUE-
DOC in FRANCE.

Varenius mentions a spring which yields a fossil oil; and *Monf. Busching* †, in his *New System of Geography*, says, that this is a black petroleum, which runs out of a rock, and is famous for the relief it affords in several distempers, such as hysteric fits, cholics, tumors from colds, worms in children, wounds, &c. and that it was first discovered in the year 1608.

SAPONACEOUS WATER OF
PLOMBIERES.

Among the waters impregnated with a fossil oil, may be placed the water called the *Saponaceous of Plombieres*, in the country

† See *English Translation*, vol. II. p. 475.

of Loraine, of which *Monf. Malouin* gives an account in the volume of the *Memoirs of the Royal Academy of Sciences for 1746, published in 1751* and of which the following is an abstract.—He analysed these waters after they were brought to Paris, and not on the spot.

He says, they are limpid as common water, and have neither a disagreeable taste nor smell; for though the taste is a little astringent, yet it is not ungrateful.

Collected in bottles they spontaneously drop a sediment, like what is got by evaporating them; but it rises again on heating the waters, though it falls again to the bottom as soon as they are cool.—They were only known to freeze in the frost of the winter 1743.

They gave no marks of an acid when mixed with alkalies; nor did they curdle milk. They turned syrup of violets greenish, but acids made no ebullition, and precipitated nothing from them; and they did not change the colour of an infusion of galls.

A solution of corrosive sublimate mercury left them limpid, but there came an oily cream a-top, as if the globules of the mercury

170 SAPONACEOUS WATER.

cury were united with a bitumen. This cream whitened copper, and the water evaporated left a sediment, which, when laid on the fire, flamed and emitted a smell of bitumen.

In distilling these waters with a gentle heat, what came first over could not be distinguished from common water; but when this ceased to run, he changed the receiver, and observed that the water which before was limpid now became turbid and white; and that the liquor distilled had a bitter taste, and rendered the syrup of violets green; and the residuum, or what remained in the retort, agreed with what had been obtained by evaporation.

Part of the residuum was then put into a crucible, and the fire increased till the crucible became red-hot, when it burnt with a blue flame like sulphur; hence he supposes, that it contained both the vitriolic acid and a bitumenous matter, which, by the force of fire, had united into sulphur.

Upon the addition of spirit of nitre, to the residuum left in the crucible, it smelled strong of hepar sulphuris, which shewed, that it contained a fixt alkaline salt.

Part

SAPONACEOUS WATER. 171

Part of the sediment of the waters, being distilled in a retort, yielded a mineral sulphur which rose into the neck of the retort, and there came over an oily liquor, which, he says, was a volatile urinous spirit, exactly resembling what is got when Soda or Smyrna earth is distilled, with a bitumenous matter.

Another part of the sediment being thrown into water, the first watery solution was oily or fat, and the second less so. The first, on being tried with the vitriolic acid, gave a smell of spirit of salt, and let drop a precipitate of an alkaline earth; owing to the acid of vitriol uniting more readily with the bitumenous matter than with the alkaline earth.

Part of the solution of the sediment, being evaporated with a slow fire, yielded a Glauber salt, and a salt approaching to that of sea salt, which salts could not be obtained by evaporating the waters themselves, as in them the acid is more strongly attracted by the bitumenous matter than the alkali; and hence no neutral salts can be said to exist in the waters in their natural form.

The

The remainder of the sediment of these solutions being put into a reverberatory furnace was found, when taken out, to have some particles mixed with it, which were attracted by the loadstone; and part of this calcined sediment, after being mixed with the vitriolic acid, struck a black colour on the addition of galls. Hence he concludes, that these waters contain a small portion of iron; but which, in their natural state, is so involved in a bitumenous matter as not to manifest itself.

The earth, which remained after all these experiments, was of the alkaline absorbent kind, and easily vitrescible.

F L E M I S H.

D O U A Y.

In the fourth volume of the *Memoirs* read before the Royal Academy of Sciences at Paris, published in 1763, *Monf. Beaume* gives an account of a water near to Douay, which has a brown colour like to a light infusion of coffee, and is of a saponaceous nature,

nature, and contained an oil and a fixt alkaline falt ; which laſt, he ſays, was of two kinds, vegetable and foſſil ; but he certainly muſt have committed ſome miſtake with reſpect to the vegetable, unleſs there are heaths and peat, or turfy foil in the neighbourhood, which has been burnt for improving and cultivating the ground. He likewiſe ſays, he got ſome ſea falt and a ſmall pittance of iron and ſome earth.

G E R M A N.

WALDSBORN.

Guintherius, in his *Dialogues de Balneis*, mentions a fountain called Waldſborn in Alſace, which has a fine fragrant ſmelling foſſil oil ſwimming a-top of it.

C H A P. II.

OF SULPHUREOUS WATERS.

WE formerly mentioned, that though sulphur be esteemed a principle common to be met with in mineral waters, yet that Dr. *Hoffman* had doubted of its existence in most of them; and that Dr. *Lucas* had alledged, that marks of a true sulphur were not to be observed in any water in its natural state; and we likewise took notice of the arguments, which had been brought for and against the existence of sulphur in mineral waters; and therefore we shall not at present enter further into this subject, but shall here only consider those waters which have a strong sulphureous smell, and which from thence have been called sulphureous, whether that smell depend on a putrefaction of the oily matter in the water, or on a true sulphureous principle.

The

SULPHUREOUS WATERS. 175

The waters commonly called sulphureous, are those which have a strong fetid smell, resembling that of a foul gun.

Some of them are alledged to yield a white cloud on being mixed with acids.

Many of them give a colour to metals, and metallic solutions, in the same manner as solutions of sulphur.

They commonly tinge the bottom of the wells, and the earth or sludge in their stream, of a black colour, and deposit a white raggy matter on the grass, leaves, branches of trees, &c. over which they run; and this matter, when thrown on the red hot iron, burns, and stinks of sulphur; and these waters are generally covered with a blueish or whitish scum.

The residuum of sulphureous waters, whether obtained by a spontaneous separation, or by evaporation, sparkles and stinks when put on a red hot iron, and sometimes, though but seldom, burns with a blue flame, the flaming being often prevented by a mixture of earth, salts, or of some other foreign matter.]

Many

176 SULPHUREOUS WATERS.

Many of these waters lose their sulphureous smell by being exposed to heat, or even to the open air.

Waters which have a sulphureous smell are commonly at the same time impregnated with some saline or metallic matter, and have different properties, according to the nature of such substances; and therefore we shall consider them under the following heads: 1. Those which contain a native alkaline salt: 2. Those which contain sea salt: 3. Those which are impregnated likewise with a calcareous Glauber salt: and shall refer those which contain iron, till we come to take a view of the chalybeate waters.

Many of these sulphureous waters are colder than the water of common springs.

SECT.

S E C T. I.

OF SULPHUREOUS WATERS IMPREGNATED WITH A NATIVE ALKALINE SALT OR NATRON.

THE first of the sulphur waters we shall mention, are those which have a native alkaline salt the most prevalent principle in their solid contents, got by evaporation.

We know that an alkaline salt is a proper menstruum for mixing sulphur with water; but all such solutions of sulphur become milky, and drop a white sediment, on the mixture of acids; and as this effect does not follow, or at least but very rarely, when acids are mixed with the mineral waters we are now treating of, it has been alledged, and I think justly, that the greater number, if not all these waters, do not contain any real sulphur, but only a sulphureous vapour, which gives them a fetid sulphureous smell.

178 SULPHUREOUS WATERS.

The waters of this sort prove diuretic, and strongly diaphoretic, and have been much used in cutaneous disorders, both applied externally, and drank as other mineral waters; and they have been used to remove chronic obstructions and disorders proceeding from an acid.

Drank in large quantity they purge and vomit.

The waters which we shall consider at present are,

ENGLISH.

SUTTON BOG.
WIGLESWORTH.
CHADLINGTON.
BILTON.
QUIN CAMEL.
NOTTINGTON.

IRISH.

DRUMGOON.
SWADLINGBAR.

DERRYLESTER.

LISBEAK.
KILLASHER.
MECHAN.
ASHWOOD.
DERRYHENCE.
DRUMASNAVE.
ANADUFF.
APHALOO.

FRENCH.

FONSANCHE.

ENGLISH

ENGLISH WATERS.

SUTTON BOG,

Situated in the county of OXFORD, near
to NORTHAMPTONSHIRE,

Is an intolerably fetid water, smelling like rotten eggs, with a saltish pungent lixivial taste.

It throws up a blue scum ; and the mud at the bottom of the well is of a jet black colour. In half an hour it turned silver of a deep copper reddish colour.

Dr. *Short*^u, who analysed this water, tells us, that a gallon yielded, by evaporation, one hundred and forty grains, nine of which were clay.

Dr. *Rutty* says, that a gallon yields from one hundred and forty to one hundred and sixty grains, nine of which were earth or clay, the rest a salt, which he found to be a mixture of the native alkali, or natron, and sea salt.

* See Vol. ii. p. 70, & 134.

180 WIGGLESWORTH.

It is a mild laxative or purging water, and is drank and used as a bath in scrophulous and cutaneous disorders, foul ulcers, and other complaints.

WIGGLESWORTH,

Near SETTLE, in YORKSHIRE.

This water is very black, and smells strong of sulphur; it tastes salt, lathers with soap, and does not curdle milk. It is always covered with a white scum.

Evaporated, a gallon, according to Dr. *Short's* account ^w, yielded two drachms and near a scruple of sediment; of which forty-three grains were a black earth, the rest a saline matter, which, from Dr. *Rutty's* experiments, proves to be a native alkali or natron, with a mixture of a small portion of sea salt. The country people drink four or five pints to vomit, and six or seven to purge them.

^w See Vol. i. p. 302.

CHADLINGTON,

In the county of OXFORD.

This water has a saltish taste, and smells like the washings of a foul gun.

Dr. *Short* * evaporated this water, and got ninety grains of solid contents from a gallon; of which seventeen were earth, the rest a salt, which he calls a peculiar nitre, but which appears from Dr. *Rutty's* experiments to be a natron, or native alkali, with a mixture of sea salt.

BILTON,

Situated near KNARESBOROUGH in
YORKSHIRE.

This water has a strong sulphureous smell, and tastes somewhat saltish; is colder than common water; for the thermometer sunk $\frac{6}{8}$ of an inch lower in it than in common water.

* See Vol. ii. p. 70, & 134.

Evaporated, Dr. *Short* got a drachm of sediment from a gallon; of which ten grains were earth; the other fifty, he says, were a marine salt; though, from Dr. *Rutty*'s experiments, the salt should seem to be a native alkali, with a mixture of sea salt, and the earth to be of the calcareous kind.

See Dr. *Short*, vol. i. p. 159.

QUIN CAMEL,

IN SOMERSETSHIRE.

This water has a fetid smell, like the washings of a foul gun, and tinges silver of a yellow or black colour, and it tinges the stones black on which it falls.

Evaporated, Dr. *Rutty* got a drachm and four grains of sediment from a gallon, which he says is composed of a calcareous earth, natron, and sea salt, mixed with a sulphureous matter.

It has been used in cutaneous disorders, and in the cure of the scrophula.

NOTTINGTON,

Near WEYMOUTH, in DORSETSHIRE,

Is a strong sulphur water, which, by evaporation, yielded forty-two grains of sediment from a gallon, seven earth, thirty-five natron ^a.

IRISH WATERS.

DRUMGOON,

In the county of FERMANAGH in *Ireland*.

This water has a strong sulphureous smell, and tinged silver put into it of a copper colour, in less than two minutes. It deposits a black sediment at the bottom of the well.

Evaporated, Dr. Rutton got eighty-three grains from a gallon; the indissoluble matter was about a scruple, the salt above a drachm, which, by the doctor's experiments, appears to be a natron, or a native alkali, with a small proportion of a marine

^a See Dr. Rutton's *Synopsis*, p. 519.

184 S W A D L I N G B A R.

salt. It has been drank for the cure of cutaneous and scrophulous disorders, and of worms.

There are two other sulphureous springs in this neighbourhood; the one pretty much of the same kind as this, which yields, by evaporation, only fifty-three grains of sediment from a gallon; the other spring has a mixture of a calcareous Glauber salt with its water.

S W A D L I N G B A R,

In the county of CAVAN.

This water is sometimes limpid and transparent, but has sometimes a whitish or wheyish appearance. It has a strong sulphureous smell, which it retains long in well corked bottles. As drawn from the fountain, Dr. *Rutty* says, it tinged silver of a blackish or copperish colour. It is not colder than common water.

The well is commonly covered with a whitish or blueish scum, and deposits a mud which burns with a blue flame on the red hot iron.

Evaporated,

DERRYLESTER. 185

Evaporated, a gallon yielded from twenty-four to sixty-four grains, or at a medium forty-three grains of sediment, of a whitish or grey colour, which had a strong urinous and a little brackish and bitterish taste. It was made up principally of natron, or the fossil alkali, with a small proportion of a calcareous Glauber salt, and of a calcareous earth.

DERRYLESTER,

Likewise in the county of CAVAN, and about three miles from SWADLINGBAR.

This is a stronger sulphureous water than the other, and has a stronger sulphureous smell.

Dr. *Rutty* evaporated this water, and got thirty-two grains of sediment from a gallon; of which two thirds were a saline matter, mostly a native alkali or natron, with a small pittance of sea salt; the other third part an indissoluble matter, composed of an absorbent and some other earth. Dr. *Rutty* says, it is somewhat lighter than common water.

LISBEAK.

L I S B E A K,

In the parish of KILLASHER, in the county
of FERMANAGH.

At this place there are two strong sulphureous waters, nearly of the same kind, which, Dr. *Rutty* says, yield, upon an average, about thirty-six grains of sediment from a gallon of the water, which is mostly made up of a pure natron, and more free of heterogeneous mixture than the sediment of most other waters, he has met with.

K I L L A S H E R,

In the same parish.

Here, Dr. *Rutty* says, there is a very strong sulphur water, which, upon dropping oil of vitriol into it, exhibited a minute ebullition, and a white cloud next morning.

A gallon, evaporated, left thirty-eight grains of sediment, which was a natron, with a small mixture of marine salt and of a calcareous Glauber.

MECHAN,

M E C H A N,

In the lands of MECHAN, in the same county,

Are two other sulphureous waters of the same nature. A gallon of the one, Dr. *Rutty* says, yielded twenty-two grains, and a gallon of the other thirty-two, nearly of the same nature as the last.

A S H W O O D,

In the same county,

Is a water of the same kind, which, evaporated, yielded twenty-eight grains of a sediment from a gallon, which was of a light brown and yellowish colour, and made up of natron, with a very little mixture of a calcareous Glauber salt.

DERRYHENCE, OR DERRYINCH,

In the same county,

Is a water of the same kind; a gallon of which, evaporated, Dr. *Rutty* says, yielded
 6 twenty-

twenty-one grains of sediment, the greater part of which was natron, with a pittance of marine salt, and perhaps likewise of a calcareous Glauber salt.

D R U M A S N A V E,

Called likewise MOUNT CAMPBELL, in the county of LEITRIM,

Is one of the strongest sulphureous waters in Ireland, which, Dr. *Rutty* says, it shews by its quick and strong effects in discolouring metals.

Its weight is nearly the same as that of common water.

It is as clear as chrystal, but before rain becomes white.

Evaporated, a gallon yielded thirty grains of sediment, of which one half was an indissoluble matter, the other a native alkaline salt, with a mixture of a small portion of a calcareous Glauber.

This water is extremely diuretic ; it purges some, though it is alledged to make others costive,

ANADUFF,

A N A D U F F,

In the same county,

Is a sulphureous water of the same kind, but weaker.

Evaporated, a gallon yielded twenty-seven grains of sediment, one half of which was a calcareous earth, the other half a natron, with a mixture of a calcareous Glauber salt.

APHALOO, OR AGHALOO,

In the county of TYRONE,

Is a sulphur water of the same kind, rather stronger than the Swadlingbar. Dr. *Rutty* says, there is a suspicion of a very small chalybeate impregnation, from galls becoming somewhat of a purplish colour at the bottom of the water; though they gave no marks of it when mixed with the water taken up at the fountain.

Evaporated, a gallon yielded in one trial thirty-two, in another thirty-five grains, which were a natron, with a mixture of a calcareous Glauber salt.

FRENCH

FRENCH WATER.

FONSANCHE,

Situated in the diocese of NISMES, in
LANGUEDOC.

This water is of a fulphureous nature, and, from the account given of it in the *Natural History of Languedoc*, contains a native alkaline salt.

This water is clear and limpid, and has a strong fulphureous smell, which goes off by keeping. It blackens silver immersed in it; and the crusts which stick to the vaults are inflammable on burning coals.

S E C T. II.

OF SULPHUREOUS WATERS
WHICH CONTAIN A TRUE
GLAUBER SALT.

WATERS of this class possess the general virtues of fulphureous waters; and they are more or less purgative, according
ing

VACIA MADRID. 191

ing to the quantity of Glauber salt they contain. Hitherto I have met with but one account of a water of this kind, which is mentioned by Dr. *Rutty* y, from the Memoirs of the French academy of sciences, which is that of Vacia Madrid, in Spain.

S P A N I S H.

VACIA MADRID.

Dr. *Rutty* tells us, that three leagues from Madrid, and five quarters of a league from a village called Vacia Madrid, are three small springs, the water of which is clear as chrystal, cold as snow, and very salt, and one of them smells strong of sulphur; and these waters do deposit on the adjacent grounds chrystals of salt, resembling the sal Glauberi, both in their figure, sensible qualities, and operation on the human body; and a like native fossil salt is found in Dauphiny, and near Grenoble.

y See Dr. *Rutty's Synopsis*, note to page 88; and *Hist. de l'Acad. Royale des Sciences*, 1724, 1727.

SECT.

S E C T. III.

OF SULPHUREOUS WATERS
CONTAINING SEA SALT.

THE next sulphureous waters we shall take a view of, are those where a sea salt is the prevailing solid principle obtained by evaporation.

These, like other sulphur waters, are used in cutaneous disorders, in the scrophula, and other chronic obstructions, and the stronger ones are found to be particularly useful in worm cases.

Those which we shall at present consider are,

ENGLISH.

HARRIGATE.
MAUDSLEY.
CRICKLE SPAW.
BRAUGHTON.
SHATTLEWOOD.
KEDDLESTONE.
DURHAM.
WARDREW.

SKIPTON.
RIPPON.

SCOTCH.

MOFFAT.
CARSTARPHIN.

GERMAN.

FRANKFORT.

ENGLISH.

HARRIGATE,

Near KNARESBOROUGH in YORKSHIRE.

Formerly there were only three springs taken notice of, but lately a fourth has been discovered; they have all a strong sulphureous smell; and, from Dr. *Short's* account, seem to be nearly of the same strength with respect to their sulphureous qualities, tho' the quantity of saline matter be different in each. As the water springs up it is clear and sparkling, and throws up a quantity of air-bubbles.

This water has a salt and sulphureous taste, and a strong sulphureous smell, which it retains after being exposed to a boiling heat, and part of the water evaporated.

This water presently blackens silver, and its solution; and likewise a solution of sugar of lead and of gold, and precipitates a black sediment with each. It turns the earth, on which it stagnates for any time, of a black colour, as well as the mud at the bottom of the well; and, after standing some time, it throws up a thick dry white scum; and both the mud and scum, if

dried in the sun, Dr. *Short* ^z says, burn with a blue flame, and smell strong of sulphur. He tells us, that when Dr. *George Neal* attended at this place, that the stones at the bottom of the well were raised, and under them was found a great quantity of yellow sublimed flowers of sulphur. However, as we before observed, this fact has been doubted by many.

And the sticks, grass, &c. in the course of this water, are covered with a white hairy mucus.

This water became white and milky with alkalies; but only appeared to be whitish with spirit of vitriol, and of a whitish clear colour with spirit of sea salt.

^z See Dr. *Short*'s account of this water in his vol. I. p. 285, &c. The Doctor in his late *Treatise on cold mineral waters in England* 1765, takes notice of further particulars, viz. That if these waters stand exposed to the open air for a few hours, they lose their transparency, turn of a pearl or whitish colour and muddy; or if bottled and sealed, they come to the same state after some time.

They lose their taste and smell of sulphur by keeping, even in well-corked and sealed bottles.

They turn linen, greens, or meat, put into them, black; and put an immediate stop to all fermentation.

The water of the first spring weighs seventy-two grains in a pint heavier than common water ; of the second spring only thirty-two grains ; of the third fifty-eight grains ; and spirits in the thermometer, sunk $\frac{3}{8}$ of an inch lower than in common water.

Evaporated, Dr. *Short* got two ounces of sediment from a gallon of the first spring water ; of which near two scruples were earth, the rest a saline matter.

A gallon of the second well yielded near half an ounce of sediment, of which two drachms and a scruple were earth.

A gallon of the third well yielded an ounce and a half of sediment, of which a drachm and twelve grains were earth.

The saline matter of these waters, from both Dr. *Short* and Dr. *Rutty's* experiments, proves to be mostly a sea salt, with a small mixture of a bittern or a calcareous Glauber.

In summer 1768, I wrote to a friend (a physician who often resides for some months at Harrigate in summer) and asked his opinion concerning the nature of the waters, and particularly about the existence of real

fulphur in them, and I had the following answer :

“ I have taken particular notice of every
“ appearance of the Harrigate waters, and
“ must own I never observed any appearance
“ of fulphur floating in them, nor any scum
“ at the top of the well ; neither could I
“ meet with any person in that quarter who
“ remembered the appearance of real ful-
“ phur sublimed, upon taking up the stones
“ at the bottom of the well, as mentioned
“ by Dr. *Neale*.

“ The waters are perfectly limpid, and
“ have a strong sulphureous smell, when
“ taken out of the well, without the least
“ appearance of a cloud in them, or a scum
“ upon the top ; but if they be exposed to
“ the atmosphere for a few hours, they
“ become turbid, and have a thin scum or
“ pellicle upon the surface, not so strong as
“ upon lime water, and they lose their sul-
“ phureous smell and deposit a whitish se-
“ diment.

“ The volatile spirit in which the ful-
“ phur (or what gives them this smell)
“ seems to reside, is so very strong, that if
“ the waters be bottled, and a sufficient
“ space

“ space is not left between the cork and
 “ the surface of the water, they burst the
 “ bottles.

“ With distilled vinegar there neither
 “ ensues an effervescence nor change of
 “ colour; but with the spirit of vitriol they
 “ become a little cloudy.

“ With all the volatile alkalies they turn
 “ immediately cloudy, and after standing
 “ some time there drops a separation to the
 “ bottom of the glass, like a strong solution
 “ of soap; and the salts are found sticking
 “ to the sides of the glass in small round
 “ grains.

“ The vegetable alkali turns them cloudy,
 “ but does not form so strong a coagulum
 “ at the bottom of the glass.”

These waters, in small quantities, are good alteratives, and, when drank in large quantity, are strongly purgative; they are drank from a pint to three quarts in the forenoon.

These, like other saline purging sulphureous waters, have been much used, and found extremely serviceable in cutaneous disorders and in scrophulous cases; and they have been found to be amongst the best remedies for destroying and evacuating

worms, and their nidus ; and to be extremely useful where the digestion has been bad, and the bowels and intestines been full of viscid slimy matter ; and to assist in removing many chronic obstructions.

They are likewise much employed for external use, by way of washes, fomentations, and baths, particularly in cutaneous disorders.

At some small distance from Harrigate, near to Knareborough, is another sulphur well of the same kind, of which a gallon leaves two drachms of solid contents, fourteen grains of which are earth. And near to Harrigate are two chalybeate springs, the strongest called the *Tuewhet Spring*, or *Alum Well*, the other the *Sweet Spring* ; but of these afterwards.

MAUDSLEY,

Situated near PRESTON in LANCASHIRE.

This water has a blueish colour, a fetid smell, and a brackish taste.

It is also a strong purging sulphureous water, which, by evaporation, yields nine hundred and sixty grains, or two ounces of sediment ; thirty grains of which, Dr. *Short* says,

says, are a calcareous earth ; the salt, from both Dr. *Short* and Dr. *Rutty's* account, should seem to be sea salt without any mixture of a calcareous Glauber.

It has been used with success in cutaneous disorders and foul ulcers, and other complaints. From Dr. *Short's* account a it appears to be a water nearly of the same kind as the Harrigate.

CRICKLE SPAW,

Situated a mile from BRAUGHTON in
LANCASHIRE,

Is likewise a strong sulphureous water, and turns silver black in the space of a minute.

Evaporated, Dr. *Short*^b says, he got five drachms and a scruple of sediment from a gallon, of which forty-eight grains were a calcareous earth, the rest a saline matter composed of sea salt and a calcareous Glauber ; but wherein Dr. *Rutty* found the sea salt to be greatly predominant.

^a Vol. ii. p. 63 and 134.

^b Vol. i. p. 300.

B R A U G H T O N,

Situated a mile from the last SPAW.

This is a strong sulphureous water, which first tarnishes and then turns silver black; copper it turns presently black; and it retains its sulphureous qualities almost at a boiling heat.

It makes the leaves of trees, moss, &c. red, and the bottom of its basin black.

Dr. *Short* ^c evaporated this water, and got four drachms from a gallon, of which a drachm or one fourth was earth; which, Dr. *Rutty* says, effervesced with strong spirit of vitriol, but did not acquire the taste of lime by calcination.

The saline matter, which was three drachms, was composed of sea salt and a calcareous Glauber; in which, Dr. *Rutty* says, the sea salt was predominant; though both these gentlemen's experiments seem to leave it doubtful, which of the two salts is in greatest quantity.

^c Ibid.

S H A T T L E.

SHATTLEWOOD,

Situated between BOLSOVER and ROMLEY in DERBYSHIRE,

Is a water which has a fulphureous smell, though not a strong one. Dr. *Short*^d evaporated it, and got two drachms of sediment from a gallon, of which five grains were earth, the rest sea salt.

KEDDLESTONE,

IN DERBYSHIRE.

This is reckoned the strongest fulphureous water in the county; it stinks intolerably; at the fountain it is extremely clear, but by standing becomes blackish; it presently turns silver of a black copper colour.

Dr. *Short* says, it lost its fulphureous smell in twenty-four hours, although the bottles were well stoppt. By evaporating this water the Doctor got four scruples of

^d *Account of Mineral Waters*, vol. i. p. 304.

sediment,

sediment, of which two scruples, two grains were earth, the rest a marine salt ^e.

D U R H A M,

Situated near to DURHAM, on the north-side of the river WARE.

This water springs out of a rock, and has a strong sulphureous smell. Evaporated, Dr. *Short* ^f got fifty-six grains from a gallon, of which eighteen were earth, thirty-eight sea salt.

Near to this, in the middle of the river, is a salt spring, which is drank as a purgative water.

WARDREW, in NORTHUMBERLAND,
Situated between CUMBERLAND and
NORTHUMBERLAND, on the banks of
the river ARDEN,

Is the most noted sulphur water in the three northern counties, and is of the same temperature with common water.

It has a very fetid smell, and loses both taste and smell by carriage and by keep-

^f Ibid. p. 305.

^g Ibid. vol. ii. p. 133.

ing. Dr. *Short* ^h evaporated this water, and got twenty-five grains of sediment from a gallon ; of which three were a light calcareous earth, the rest sea salt.

S H I P T O N,

In YORKSHIRE,

Is a sulphureous water, which neither curdles soap nor milk. Evaporated ⁱ, a gallon yielded two drachms, two scruples ; of which twenty-four grains were earth, the rest a calcareous Glauber and sea salt.

R I P P O N,

Is another sulphur water of the same kind ; a gallon of which yielded one drachm, six grains of sediment ^k, near one half of which was earth.

^h See vol. ii. p. 62 and 133.

ⁱ Dr. *Short's Treatise* 1765. p. 71.

^k Ibid. p. 72.

LLANDRINDOD,

In the parish of LLANDRINDOD, in the county of RADNOR, in SOUTH WALES,

Is a strong sulphureous water, of which Dr. *Linden* gives an account, but so indistinct, as to render it impossible from thence to ascertain the substances with which it is impregnated; though from the whole it should seem to be a sulphureous water, which contains sea salt.

He recommends the drinking and bathing in this water, for a variety of complaints in which sulphureous waters are used. He says, the quantity to be drank cannot, in general, be determined; but that it is always best to begin with one that is small, from a pint to a quart in the morning taken at repeated draughts; and that this quantity may be increased as the constitution will bear, which is, as much as will sit easy on the stomach and pass off well. When it gives the least uneasiness, it is a sure sign that the dose is too large.

SCOTS SULPHUREOUS
WATERS.

M O F F A T,

In the county of ANNANDALE.

At this place there are two springs, the waters of which have a strong sulphureous smell and taste. The upper well is the strongest, and most nauseous, and therefore is not drank so commonly as the other; but as it bears heat better, it is more used for bathing in.

The water at the fountain, Mr. *Milligen*¹ says, has a milky or blueish colour, though after it was carried forty miles in close stoppt bottles, it was as limpid and pure as common water. If it is let stand in an open bottle, it loses both its distinguishing taste and smell, though if the bottle be well stoppt, it will retain both a considerable time, and even bear carriage; as Dr. *Short* informs us in the 74th page of the second volume of his *Natural History of Mineral Waters*.

¹ See *Edinburgh Medical Essays*, vol. i. art. 7.

Dr. *Plummer* ^m, who analysed this water, tells us, that oleum tartari per deliquium only gave a faint blue cloud, and that acids turned the water more or less milky, though it dropt no sediment afterwards.

The Doctor evaporated this water, and got between fifty-four and fifty-five grains of sediment from a gallon; of which between four and five grains were a saltish mud, which contained three grains of earth, and the other fifty grains were sea salt. He seems to suspect that this water contains a very small portion of copper; but as he could not discover this by any experiments he tried, it is most probable it contains no copper; though an experiment made by the Reverend Dr. Walker of Moffat seems to make that doubtful; for a fine polished plate of iron put into the well, and let remain for some time, contracted a green rust.

Dr. *Short* obtained nearly the same principles from this water as Dr. *Plummer*; but he seems to suspect that the sea salt has a small mixture of a calcareous Glauber salt.

^m *Edinburgh Medical Essays*, vol. i. art. 8.

This water proves mostly an alterant and diuretic; it generally opens the belly; and it purges some people.

Like other sulphureous waters, it has been much used in cutaneous disorders and in chronic obstructions; and it has been esteemed particularly useful in scrophulous complaints; it has been found serviceable in cholic pains and pains of the stomach, and in many bowel complaints. Mr. *Mil-ligen* says, that formerly people used to drink this water in too large quantity, but that he seldom advised the strongest people to drink above three or four English quarts at most in the day, and those of a weakly constitution not above two, and children, according to their age and constitution, from a gill to a pint.

Before beginning a course of this water, he thinks it right to empty the first passages; and afterwards, where purging is thought necessary, or the waters do not pass off readily, to mix some purging salts with the first glasses of the water, but not to repeat the doses of the purging salts too often, particularly with people of weakly constitutions. If the water stay in the body long,

long, it will be necessary to let blood, which will facilitate the operation of diuretics, and prevent feverish fits. He mentions a caution with respect to the use of this water, which is, that in all disorders for which people resort to Moffat, the water ought not to be drank while the patient has a cough, even though a slight one; for it seldom fails to increase and bind it: it is also to be prescribed with caution, when the patient is hectically disposed; and it will most certainly do mischief, where there are tubercles or other infections of the lungs. But, these cases only excepted, the water may be used with great freedom.

This water has been likewise much employed for washing scrophulous sores and foul ulcers, and for wetting cloths to be kept applied to such parts; and it has been warmed, and used by way of baths to particular parts and to the whole body. Mr. *Mil-ligen* tells us, that formerly the baths used to be made hot, but that in general tepid baths are most useful. The steams of this water, made hot, have been much used for softening and relaxing hard swelled parts and stiff joints, and been found to be of remarkable service.

CARSTARPHIN,

Two miles from EDINBURGH,

Is a weak sulphureous water, from which Dr. *Short* got, by evaporation, eleven grains of sediment from a gallon, four grains of which were clay, and seven grains a saline matter, composed of sea salt and a calcareous Glauber.

This water has likewise been much used for the cure of scrophulous disorders.

There is another sulphur spring about a mile from Edinburgh, situated on the banks of the water of Leith; it is said to be stronger than the Carstarphin, and to approach nearer to the nature of the Moffat; but hitherto no analysis of it has been published.

GERMAN WATERS.

FRANKFORT.

Dr. *J. Ph. Burggrave* mentions two very strong sulphureous waters, situated in the neighbourhood of Frankfort on the

Maine : the one is called the *Faulpump*, and has a greenish colour; a gallon, evaporated, yielded between sixty-six and sixty-seven grains of sediment, composed of a calcareous earth and sea salt mixed with an oily matter. The other, called *Fons Scabiosorum*, is of the same kind.

See his Treatise, De aëre, aquis, et locis, urbis Frankofurtanæ ad Mænum.

B I E L E F E L D,

In the county of RAVENSBERG in WEST-PHALIA.

Near this place is a limpid, saltish, sub-acrid water, which tinges silver, and contains a good deal of mineral spirit, and said sometimes to have a subacid taste. Evaporated, it leaves a small portion of a white calcareous matter.

This account, given by Dr. *Con. Redcker* in 1668, is very incomplete, and, as *Kieger* observes, does not ascertain sufficiently the nature of this water.

S E C T. IV.

OF SULPHUREOUS WATERS,
WHICH CONTAIN A CALCA-
REOUS GLAUBER SALT.

THE next sulphureous waters which we shall consider, are those which contain a calcareous Glauber salt, and where it is found to be the most prevalent of the fixed principles, obtained by evaporation.

These waters have commonly more or less of a purgative quality, and are used in cutaneous disorders, in the scrophula, and in other chronic obstructions, and in cases of worms, and foulness of the bowels.

Those which we shall consider are,

ENGLISH.

ASKERON.
CROFT.
CAWLEY.
CUNLEY HOUSE.
BUGLAWTON.
LOANSBURY.
NORMANBY.
SHAPMOOR.
UPMINSTER.

CODSALWOOD.
WIRKSWORTH.

IRISH.

DERRINDAFF.
OWEN BREUN.
PETTIGOE.

GERMAN.

NEWLAND.
WERSINGOVA.
REUTLINGA.

ENGLISH WATERS.

ASKERON,

Five miles from DONCASTER, in YORK-
SHIRE,

Is an exceeding clear water, the stream of which is full of a thick white sludge; it smells and tastes very strong of sulphur.

Dr. *Short* evaporated this water, and got two drachms, one scruple, and four grains of sediment from a gallon; forty-eight grains of this were a calcareous Glauber mixed with sea salt, a drachm and thirty-six grains were earthⁿ.

It is a very diuretic, light water, and said to have done many eminent cures, both by bathing and drinking, in inveterate strumous and other ulcers, scab, leprosy, &c.

ⁿ See vol. i. p. 303.

CROFT,

C R O F T,

In YORKSHIRE, on the confines of DUR-
HAM,

Is a fine clear sparkling water, which smells strong of sulphur, and its stream does not rise or fall by rain or drought. Dr. *Short* ^o says, it is drank from four to nine pints, and that it performed several remarkable cures.

Evaporated, Dr. *Short* ^p got from a gallon one hundred and ninety grains, or three drachms, ten grains of a white sediment; of which he found one hundred and fifty grains to be a light calcareous earth, and two scruples to be a saline matter, made up of thirty grains of a calcareous Glauber salt, and ten grains of a sea salt.

C A W L E Y,

A mile from DRANEFIELD, in DERBY-
SHIRE,

Dr. *Short* ^q says, this is a sulphureous water, which is perfectly clear, whilst

^o Vol. i. p. 399. ^p Vol. ii. p. 134. ^q Vol. i. p. 305.

214 CUNLEY HOUSE.

whilst fresh in the basin, but becomes blackish when it stagnates, and yet turns every extraneous body in its basin of a very white colour.

Evaporated, a gallon yielded between thirty-nine and forty grains of sediment, whereof nine were earth, the rest a calcareous Glauber salt.

CUNLEY HOUSE,

Two miles from WHALEY in LANCA-
SHIRE.

This spring rises up in a wet mossy ground, and discharges a larger quantity than common, of a blueish colour and a strong sulphureous smelling mineral water; its steam brightens gold, and presently turns white metals of a black colour. It differs little in weight from common water.

Dr. *Short*^r evaporated this water, and got forty-nine grains of sediment from a gallon; eighteen grains of which were a mossy earth, thirty-one grains a calcareous Glauber salt.

^r Dr. *Short on mineral waters*, vol. ii. p. 60 and 134.

BUGLAWTON,

Near CONGLETON in CHESHIRE.

This water rises out of a deep sand and is intensely cold. It has a pretty strong sulphureous smell and taste.

Evaporated, Dr. *Short*^s got twenty-seven grains of sediment from a gallon; eleven grains of which were a light calcareous earth, sixteen grains a calcareous Glauber salt.

LOANSBURY,

In Lord BURLINGTON's Park in YORKSHIRE,

Is almost a stagnant water, which has a strong sulphureous smell; and, by evaporation, yields about twenty grains of sediment from a gallon, composed of a light calcareous earth and a calcareous Glauber salt. Dr. *Short*^t says, when he was there it was only used for washing scabbed horses or mangy dogs.

^s Ibid. p. 62.

^t Ibid. p. 61.

N O R M A N B Y,

Four miles from PICKERING in YORK-
SHIRE,

Is a very clear, beautiful, and fetid water, which seems highly impregnated with a mineral spirit, for it sparkles like Champagne wine, when poured out. It turns black, thick, curdles, and lets fall a sediment with solutions of silver, and of sugar of lead. The spring affords about sixty gallons of water in an hour, and the well is always covered with a blue scum.

It yields but a small quantity of solid matter by evaporation ; at most half a drachm from a gallon, and often not near that quantity. The saline matter of this sediment, Dr. *Short* ^u says, is made up of two parts of a calcareous Glauber salt and one of sea salt.

It is said to purge gently.

^u Vol. p. 299.

SHAPMOOR,

Situated between SHAP and ORTON, in the county of WESTMORLAND.

This, Dr. *Rutty* says, is a very strong sulphureous water, which retained its taste and smell when brought to Dublin; it was transparent when poured out of the bottles, but acquired a blueish cast after it had stood for some days; silver immersed in it soon became of a dark brown, and copper colour.

A gallon, evaporated, yielded six drachms and sixteen grains of a sediment, in which there were only six grains of earth; the rest was a saline matter, which, he says, is mostly a peculiar sort of calcareous Glauber salt, mixed with sea salt, and a small portion of natron; but he made no experiments to determine the exact proportion of these salts.

Three pints of this water prove purgative.

U P M I N S T E R,

Near BRENTWOOD in ESSEX,

Is a strong sulphureous water, which, Dr. *Rutty* says, had still retained its sulphureous smell, and was clear and void of sediment when brought to Dublin, and turned silver of a copperish and livid colour in a quarter of an hour.

The Doctor evaporated this water, and got five drachms and thirty-two grains of sediment from a gallon, composed of salts and an indissoluble matter, the proportion of which he does not mention; but says, the saline part is chiefly a calcareous Glauber salt with a small mixture of natron.

This water is purgative and diuretic in its operation.

C O D S A L W O O D,

Situated five miles from WOOLVERHAMPTON in STAFFORDSHIRE.

This water, Dr. *Short* says ^w, has a very strong sulphureous smell, which it loses by

^w Vol. ii. p. 63.

standing or carriage. It quickly changes silver of a copper colour, and leaves a white sludge in its receiver, but yet black below; by evaporation, a gallon only yielded five grains of a light calcareous earth.

WIRKSWORTH,

IN DERBYSHIRE,

Dr. *Short* says ^x, is one of the weakest sulphur springs he has seen; its water is very black, and it strikes a deep blue with tincture of galls.

Evaporated, a gallon afforded forty grains of sediment, of which twenty-two grains were a black earth, the rest a saline matter, which, when dissolved and chrystallized, projected chrystals of a pure calcareous Glauber salt.

It is much used in cutaneous and scrophulous disorders. As it seems to be a chalybeate or vitriolic, it might perhaps more properly have been placed among the sulphureous chalybeates.

^x Vol. i. p. 307.

I R I S H W A T E R S.

D E R R I N D A F F,

Situated in the county of CAVAN,

Is a clear sulphur water, which, Dr. *Rutty* says, retained its smell and taste when brought to Dublin. It coloured white metals, and gave strong marks of sulphur with their solutions.

Evaporated, a gallon left twenty-three grains of sediment, which stunk and had a fetid smell; and on trial proved to be composed of a calcareous Glauber salt and an indissoluble matter.

O W E N B R E U N,

Situated in the same county of CAVAN,

Is a clear fetid sulphureous water, which in the well is commonly covered with a dark coloured scum. It bears carriage, and retains its sulphureous taste after being made scalding hot. It colours white metals, and affects their solutions.

Dr.

Dr. *Rutty* evaporated this water, and got forty-three grains of sediment from a gallon; seventeen grains and a half were an indissoluble matter, partly a calcareous earth; twenty-five grains a calcareous Glauber salt joined to a small portion of natron.

P E T T I G O E,

Situated in the county of DONEGAL,

Is one of the strongest sulphur waters in Ireland; which it shews by its effects on white metals and their solutions: is of the same weight as distilled water.

Dr. *Rutty* got by evaporation fifty-eight grains of sediment from a gallon, which was partly white and partly dark coloured; ten and a half grains were a calcareous earth; forty-seven and a half grains a saline matter, which by every trial proved to be a calcareous Glauber salt.

G E R M A N W A T E R S.

NEULAND, in SILESIA,

Is a sulphur water, which from the abstract of the account from the *German*

Ephemerides, n. a. c. cent. 7 and 8. given in Dr. Rutty's *Synopsis*, does not seem to have been sufficiently examined to determine exactly its nature ; from its curdling-milk, the Doctor concludes, that it contains a calcareous Glauber salt. By evaporation it yielded near in the proportion of forty-eight grains of sediment from the gallon, which was of a greyish colour without much taste or smell.

W O R S I N G A V A,

In the LOWER SILESIA,

Is a clear limpid and strong sulphureous water, which does not freeze in the hardest frost, and has commonly a white pellicle swimming a-top of its well. It tinges silver very black ; with alkalies it became turbid, and with syrup of violets green, and with galls greenish ; and it killed fishes thrown into it.

Rieger y, in his *Introduction to the knowledge of natural things*, mentions, that, in

^y Rieger's account is taken from the *Ephem. a. n. c. cent. 5. obs. 64.*

evaporating this water, there were got about forty grains of sediment from a gallon, which had a salt bitterish taste, and melted in the red-hot iron.

REUTLINGA, near TUBINGA,

Is a sulphureous water of which we have an account in the *Ephemerides Germanicæ*, a. n. c. cent. 3 and 4. *obs.* 133. It seems to contain a calcareous Glauber salt; but the account given of it is not sufficiently distinct.

F R E N C H.

CRANSAC, in the province of GUYENNE,

Mr. *Busching* ^z says, is a little place, noted for its excellent sulphureous mineral waters.

^z See his *New System of Geography*, English translat. vol. ii. p. 499.

S E C T. V.

OF SULPHUREOUS WATERS
WHICH HAVE NOT BEEN SO
ACCURATELY EXAMINED
AS TO DETERMINE TO
WHICH OF THE FOREGO-
ING CLASSES THEY BELONG.

ITALIAN.

ARDEA.
BAIA AND PUTEOLI.
BORRA.
AGNANO.
ST. MARINUS.
CARPI.
VITERBO.

GERMAN.

AQUÆ FERINÆ.
VILLINGEN.
WATTWEYL.
SLATINA.
BUCHLOVIA.
PETROVIA.
KORYTNA.

SWITZ.

CORIA.

ITALIAN.

ARDEA,

Near the Old Town of ARDEA, in the
CAMPANIA,

IS a cold sulphureous water, which has a
corrupted taste and smell.

BAIA

BAIA AND PUTEOLI.

In this district *Baccius* says, there are several cold sulphureous purging waters, some of them he calls nitrous, and others, he says, taste saltish. It is probable, that these waters are impregnated with a calcareous Glauber or with sea salt, or with both, and perhaps with a portion of natron.

BORRA,

In the country of SIENA, is situated near the Convent of ST. JANUS, above the RIVER ARBIA.

This water is limpid, and tastes and smells sulphureous; and is unpleasant on first drinking. It operates strongly by stool and by urine, and it sometimes vomits; it is called nitrous and solutive.

AGNANO,

In the country of PISA.

The water of the baths of this place is extremely cold and sulphureous.

ST. MARINUS,

In the VIA FLAMINIA, under the APPENNINE mountains, between the rivers ISAURUS now FOGLEA, and ARMINUS now RIMINI, fifteen miles from the Upper Sea.

Baccius says, there is a spring or fountain of a cold and sulphureous smelling water, which is salt and nitrous, and contains iron; and the sediment obtained from it, by evaporation, flamed and crackled when put on the fire.

It purges strongly, and operates by urine, taken from half a pound to a pound and a half. The country people often drink it to purge them, till it pass off as clear by stool as when taken down.

CARPI,

Near the APPENNINE mountains,

Is a cold sulphureous water, which *Baccius* mentions under the name of Aqua Blandula.

NEASEOUS

NEASEOUS WATER.

At VITERBO, in ETRURIA.

Near to this place, in a space less than twelve feet, are two springs of very sulphureous waters which drop a thick sediment, the one is hot, the other exceeding cold.

SWITZ.

CORIA.

Baccius tells us, that about three miles from the town of Chur or Coria, in the canton of Zurich, are cold sulphureous waters which incrustate wood, or other things put into them, with a hard coat.

SIMIA,

In the country of BERN, in the lower valley of SIMIA, in the district of SAANEN.

Monf. *Gruner* ^a tells us, that there is a sulphureous water which deposits a quantity of sulphur.

^a See Supplement in part 3. *Comment. de Reb. gestis in Medicina*, &c. pag. 442.

A N D E R S,
In SWITZERLAND, near to the source of
the RHYNE.

Not far from this place is a bath, called
the Red Bath, which is supplied by a cold
fulphureous water ^b.

G E R M A N.

A Q U Æ F E R I N Æ,
In the marquifate of WIRTEMBERG, not
far from the town of ZELL,

Are the fulphureous waters which *Bac-*
cius says, were formerly called *Aquæ Fe-*
rinæ or *Sylvestres*.

V I L L E N G E N.

And *Guintherius* ^c mentions a fulphu-
reous water at the town of *Villengen* in
Swabia, situated a little south of the head
of the Necker.

^b Ibid. p. 445.

^c *De Balneis*.

W A T T W E Y L.

And he mentions another, which he calls nitro-fulphureous, at a place called Wattweyl.

S L A T I N A,

In the district of PLUMLOVIA, in the country of MORAVIA, is a village called SLATINA.

Dr. T. Jordan ^d says, there is a very hard rock at this place, from several fissures of which there issues a very limpid water, which has a strong sulphureous smell and taste, and which received into a silver cup tarnishes it immediately.

The water, as it came out of the rock, had a number of white flocculi swimming every where through it; and in the fissures thro' which it runs there was lodged a large quantity of black fetid mud, which had the same smell as the waters; it was black like gunpowder, and, when put into a dish, it

^a Dr. T. Jordan *de aquis medicatis Moraviæ* Comment. 1586.

made it so black, that it could scarce be washed out again; when dried it retained the same fetid sulphureous smell as before.

The water evaporated left a white calcareous earth which tasted a little saltish.

From all which Dr. *Jordan* concludes, that these waters contain a subtile sulphur, a calcareous earth, and a salt; to which the Doctor, according to the custom of his time, but without any just grounds, adds a little alum.

BUCHLOVIA,

Near the castle and town of BUCHLOVIA,
in MORAVIA,

Is a very fetid sulphureous water, which the inhabitants call *Smrda Wka*, which signifies the stinking well.

This water, Dr. *Jordan* says, rushes out of a very hard rock, and is extremely limpid: it is of the same nature as the Slatina water, but does not contain so much calcareous earth.

PETRO-

P E T R O V I A,

A village on the banks of the river MORA,
in the country of MORAVIA.

Here there is a cold sulphureous spring, the water of which, Dr. *Jordan* says, loses its sulphureous smell by boiling. Evaporated, the Doctor got a white earth, which tasted saltish, and he judged this sediment to be a gypseous earth, mixed with a little nitre and salt.

Dr. *Jordan* drank of this water, and it purged him strongly next day.

K O R Y T N A,

About a mile from HUNNOBRODA, in the district of KORYTNA, in the country of MORAVIA.

Dr. *Jordan* says, that here there is a very fetid sulphureous water, situated on a high, almost inaccessible rock, in the midst of a very thick wood.

The water is of a black colour, and has a very fetid disagreeable sulphureous taste

and smell, and there was a great deal of a thick fetid mud at the bottom of the well.

The Doctor distilled this water, and had remaining a substance resembling tartar, which had something of an aromatic smell, which he compares to that of aloes. The laminæ put in the mouth tasted at first salt, and then extremely bitter ; put on the fire, they became black, but did not smok.

Dr. *Jordan* esteems this the strongest sulphureous water in Moravia,

C L A S S III.

O F C O L D W A T E R S.

WATERS IMPREGNATED WITH
SOME METALLIC MATTER.

C H A P. I.

O F W A T E R S I M P R E G N A T E D
W I T H C O P P E R.

THE waters impregnated with metallic substances which we shall first consider, are those which contain copper, dissolved by means of the vitriolic acid.

We have not a distinct account of many such waters ; and several of those mentioned by authors seem to contain iron as well as copper.

Iron immersed in waters which contain copper is dissolved ; and as this happens,
the

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the copper is precipitated, and supplies the place of the iron which is dissolved, so as at last to form an intire piece of copper, of the same shape as the iron was before ; and hence these waters have been said to have the property of changing iron into copper.

Waters impregnated with a vitriol of copper turn at first green with an infusion of galls ; and beef and mutton infused in them lose their redness, and become of a whitish blueish colour ; and volatile alkalies mixed with them exhibit a sapphirine blue coloured cloud.

Those strongly impregnated with copper are violently emetic, and are purgative, and have sometimes been used in obstinate disorders, though they are not remedies which any judicious physician would recommend for general use ; for solutions of copper have been found to be prejudicial to health, and often to produce the worst of symptoms.

As waters of this class are not drank for health, I shall do little more than name some of the principal ones, which are taken notice of by authors ; to wit,

IRISH.

IRISH.

BALLYMURTOGH.
CRONEBAUN.

AMERICAN.

PENNSILVANIA.

GERMAN.

NEUSOL.
HERENGRUNDE.
SCHMELNIZ.
GOSLAR.

FRENCH.

CHEISSY.

IRISH.

BALLYMURTOGH AND
CRONEBAUN,

In the county of WICKLOW,

Two waters which come from copper mines, situated near to each other, the one on the south-side of the river *Arklow*, the other on the north-side.

Iron thrown into these waters is dissolved, and the copper precipitated, and hence they are said to change iron into copper.

Dr. *Rutty* evaporated these two waters; a gallon of the *Ballymurtoogh* water yielded seven drachms and a half of sediment from a gallon, which, when dissolved in distilled water, and set to chrySTALLIZE, afforded

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afforded fair green and blueish chryftals, and a little white vitriol.

And a gallon of the *Cronebaun* water yielded only four drachms and fixteen grains of fediment, which contained both blue and green vitriol.

A M E R I C A N.

P E N N S I L V A N I A,

I N N O R T H - A M E R I C A.

In this province is a copper mine, which affords a water impregnated with a cupreous vitriol, which Dr. *Rutty* fays is the ftrongeft vitriolic water known. He tells us, that he evaporated this water, and from a gallon obtained fix ounces, five drachms, and a fcruple of fediment ; of this not much above half a drachm was an indiffoluble matter.

The fediment yielded chryftals of both the blue and green vitriol : he fays, the ferruginous principles were moft prevalent, but he does not mention the proportions of each.

GERMAN AND HUNGARIAN.

NEUSOL, in HUNGARY.

In the Philosophical Transactions, N^o 450, there is an account of a water at this place, which yielded five drachms and a scruple of vitriol of copper from a gallon.

There are several other waters of this kind in Hungary and Germany, which are mentioned by count Marfili, in his Natural History of the Danube; in Brown's Travels; and in Cartheuser's Rudimenta Hydrologiæ; such as,

The water at Herengrunde, near to Neusol.

———— at Schmelnitz.

———— at Cement.

———— at Altenberg, in Misnia.

———— at Goslar, near the Harts forest.

And at other places.

FRENCH.

CHEISSY.

And the water at Cheissy in the Lyonnais, of which there is an account in the
Memoirs

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Memoirs de l'Academ. des Sciences, 1728,
is of the same kind.

Dr. *Rutty*, in his Synopsis of Mineral Waters, Introduction to *Book* iv. p. 263. says, that the following waters betray a mixture of copper :

A water at Haigh in Lancashire,
near Swanzey, in Wales.

———— at Crofs, in the county of
Waterford, in Ireland.

———— at Ballycastle, in the county
of Antrim.

———— at Nobber, in the county of
Meath.

———— at Kilbrew, in the same county.

C H A P. II.

OF WATERS IMPREGNATED WITH IRON.

THE waters we are next to examine,
are those impregnated with iron ; they
are among the most useful and beneficial
to health of any of those called mineral,
and are so plentiful in this island, that there
is

is scarce a parish without one or more of them.

It is very difficult to arrange properly the waters which belong to this class; and it is not easy to ascertain exactly the principles they contain, for we find a mixture of every substance found in other waters combined with iron in some one or other of these; few of them contain only a pure solution of iron; besides the solid principles are often in very small quantity, and the volatile are too subtile to be subjected to chymical experiments, or to become the objects of our senses.

Waters are known to be chalybeates, or to contain iron, by their striking a reddish, purple, or black colour with an infusion of galls; and according to the height of the colour we judge in some measure of the water being a weak or a strong chalybeate; though we ought to be careful in making the experiments, and to remember that some of the waters which are highly impregnated with a mineral spirit, such as those of Spaw, &c. strike a higher colour with an infusion of galls, after they have stood

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stood a little while, than when they are immediately taken up from the fountain.

And they are known likewise to contain iron, by their sediments, obtained by evaporation, containing particles which are attracted by the loadstone.

Authors have divided waters impregnated with iron into the *vitriolic* and *chalybeate*; they have called those *vitriolic* from which chrystals of green vitriol have been obtained by evaporating the water, and those *chalybeate* which give marks of a ferruginous impregnation, but from which no solid vitriolic salt is to be got by art.

Both these waters are impregnated in the same manner with iron dissolved by a vitriolic acid ^a; the difference betwixt them is, that the waters called *vitriolic* contain a large proportion of iron, dissolved by

^a From some chalybeate waters giving so very slight marks of their containing any acid, even in their most perfect state, when just taken up from their wells, it may perhaps be hereafter discovered that iron, as well as earth, may be suspended in water, by its either being deprived of air, or by its containing too large a proportion of it. However, this is what can only be determined by accurate experiments; for we must take nothing for granted *à priori* in cases which can be determined by experiment.

fixed vitriolic acid, with respect to the other solid principles; whereas those called *chalybeate* contain in general but a small proportion of iron, and that mixed with some alkaline or neutral salt, or some earthy matter, which prevents the vitriolic salt from chrySTALLIZING; besides, their acid is often in a volatile state^a, and the greater part of it flies off in evaporating the water.

The vitriolic waters strike a dark blue or black with an infusion of galls; they coagulate milk, and have somewhat of an aluminous taste. The *chalybeate* strike from a faint red to a dark purple with an infusion of galls, according as they are weaker or stronger; they in general mix smoothly with milk; and the greater number taste of iron, though those which are strongly impregnated with a mineral spirit, and a volatile acid, have a brisk vinous taste, as taken immediately up from the fountain.

They all tinge the stools of the drinkers of a black colour.

^a If Mr. Lane's theory hold true, the iron may be found to be suspended or dissolved in many of these waters, by means of fixed air, and not by an acid.

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All the waters of this class, both vitriolic and chalybeate, like other preparations of iron, have more or less of an astringent quality; they quicken the pulse, and increase the heat and momentum of the blood, and the tone of the fibres; and hence they are much used as strengtheners, in cases where the *vis vitæ* is low, the blood too thin and watery, and the fibres weak and lax; in female obstructions; in the fluor albus and gleets; in spasmodic disorders, from weakness, and too great an irritability of the nervous system; in cases of worms, where the intestines are weak, and overloaded with a viscid mucus; and in short in most cases where the intentions are to increase the *vis vitæ*, and to invigorate the whole system; but they are for the most part contra-indicated, where there is much heat and fever, in cases of confirmed obstructions attended with fever, in pulmonary and other internal ulcers, where there is no free outlet for the matter, and in most hectic fevers.

In cases where there is any degree of heat or fever, and in plethoric habits, it is often necessary to take away a little blood before

before beginning a course of waters of this kind; and in general, it is right for the patient to take a dose or two of some mild purgative medicine, such as of Rochelle or Epsom salts, of tartar solubilis, rhubarb, manna, or such like, to empty the bowels before beginning to drink the waters; and if, during the course, the patient be inclined to be costive, it is proper to mix from time to time salts, or some other purgative, with the first glass of water in the morning.

Patients ought to begin with drinking a small quantity of these waters each morning, and gradually to increase the dose; during the course, to use moderate exercise, to live on a mild light diet of easy digestion, composed of animal and vegetable substances, avoiding the use of high seasoned foods, and of vegetables that are flatulent, or too acrescent; to be moderate in the use of generous liquors, for although a small quantity of a good generous wine, properly diluted, is a good drink to meals, yet too much of these liquors heat and are prejudicial. In general, patients ought not to eat breakfast till an hour after drinking the last glass of the waters in the morning, and

to eat but little at night, and that at an early hour, that it may be in part digested before the time of going to sleep.

Tea, and other things which decompose the waters, ought not to be taken immediately after drinking them. Milk is improper with the strong vitriolic waters which curdle it, but is found to agree with those chalybeates which mix smoothly with it.

As waters containing iron have different virtues, and are used differently, according as they are stronger or weaker, as they contain more or less of the mineral spirit, or are impregnated with heterogeneous substances, we shall say no more of the manner of using them till we come to treat of the particular waters, ranged under the following heads: 1st. The stronger sort, called vitriolic. 2d. Those chalybeates from which little other solid matter than an ochreous earth has been got; and those whose solid contents have not hitherto been accurately examined. 3d. Those which contain a native alkaline salt or natron. 4th. Those which contain sea salt. 5th. Those which contain a calcareous Glauber salt. 6th. Those which were alledged to contain
alum.

alum. 7th and lastly. Those which have a strong sulphureous smell, and from thence have been called sulphureous chalybeates.

When waters impregnated with iron are too cold for the stomachs of weak patients, they may be warmed, by mixing some warm water with them just before they are drank; but they ought never to be heated (especially those which contain a mineral spirit, or whose acid is in a volatile state) by putting them over a fire, for that decomposes the water.

S E C T. I.

OF WATERS WHICH YIELD A MARTIAL VITRIOL, BY EVAPORATION.

THESE waters, as we before observed, are strongly impregnated with iron, by means of a fixed vitriolic acid, which gives marks of being prevalent in many of them, and upon evaporation they yield a

true vitriolum martis ; they give a blackish blue colour with galls.

Several waters of this kind are to be met with in this island, in and near to coal-pits.

These waters have the general virtues of those impregnated with iron, though many of them are too strong to be used as internal medicines, except in small doses in particular cases; being strongly emetic and purgative, if drank the length of ten or twelve ounces. Most of them have been used by the vulgar for washing and healing old sores, and frequently with good effect.

Those we shall consider under this head, are,

ENGLISH.

SHADWELL.

WESTWOOD.

SWANZY.

HAIGH.

SCOTCH.

HARTFELL.

IRISH.

CROSSTOWN.

NOBBER.

CASHMORE.

KILBREW.

FRENCH.

VAHLS.

RUSS.

OLONICENCES.

ENGLISH

2 [1 247 A] W 30 342

ENGLISH WATERS.

S. H A D W E L L,

Situated in SUN-TAVERN-FIELDS, 'ST.
PAUL'S SHADWELL, about two miles
below the Tower of LONDON,

Is one of the strongest waters of this
kind that has been discovered in England.

This water has an acid, austere vitriolic
taste, and gives a blueish black colour with
galls, and a dark olive green with syrup of
violets.

Dr. Ratty evaporated this water, and got
one thousand three hundred and twenty
grains, or two ounces, six drachms of sedi-
ment, from a gallon; of which two oun-
ces, two drachms, fifty-two grains were a
sal martis; and three drachms, eight grains
were a yellowish brown-coloured ochreous
earth, which neither effervesced with acids
nor alkalies, but turned greenish when rub-
bed with syrup of violets.

The Doctor says, the sediment moistened
in the air, and the salt curdled milk when
cold, in the proportion of less than half a
Q 4 drachm

drachm to the pint ; and it turned presently red with syrup of violets.

This water has been taken the length of a pint, divided into two or three doses, in the space of an hour, of a morning, when it is found to vomit and to give two or three loose stools ; it has been alledged to have been of service in some old obstinate gleets, and in the fluor albus, and in old dysenteric cases ; but it is more commonly used by way of an external than an internal remedy.

W E S T W O O D,

Situated near TANDERSLEY, in DERBY-SHIRE,

Is a water which, Dr. *Short*^b says, yields pure chrystals of vitriol, and no other salt ; but he neither gives us any particular analysis of it, nor does he mention the proportion of vitriol got from it by evaporation.

He recommends its external use for old sores of the legs.

^b *Short on Mineral Waters*, vol. i. p. 283.

And he observes, that chryſtals of vitriol are to be got from all the coal waters in this county.

S W A N Z Y, in WALES.

This ſpring is in the neighbourhood of a coal mine.

It is a weak water of the ſame kind, which Dr. *Rutty* ſays, yielded only forty grains of ſediment from a gallon; of which thirty-two grains were a native martial vitriol, and eight grains an ochreous earth.

The ſediment was of a light brown colour, and had a highly acid, acerb, vitriolic taſte.

Hitherto this water has been but ſeldom uſed as an internal remedy.

From its giving ſomewhat of a high red copper colour to the blade of a knife, Dr. *Rutty* ſuſpects it to have ſome admixture of copper.

H A I G H, in LANCASHIRE.

A ſpring in the pits of kennel coal at this place ſeems to belong to this claſs, but
we

we have no particular account of it, nor any analysis related which can be depended upon.

SCOTCH WATERS.

HARTFELL,

In the county of ANNANDALE.

This spring issues from the Hartfell mountain, about three miles distant from Moffat; it was first taken notice of in the year 1748, and we have an *account of it in the Edinburgh physical and medicinal Essays*, vol. i. art. xii. by Dr. Horsburgh. He examined this water, four days after it had been taken up from the spring, and put immediately into bottles which were well corked and sealed.

It was then quite clear and pellucid, had a sharp aluminous, and strong chalybeate styptic taste. It curdled with soap, but did not curdle with milk, when either mixed or boiled with it; with syrup of violets it gave a faint green colour, and with galls it presently struck a blue, which heightened to a purple, and at last became of an ink colour.

It

It made no effervescence with oleum vitrioli, nor with lixivium of tartar; but immediately on mixing this last there appeared light green clouds.

This water turns weaker by being exposed to the air; but still retains a great deal of its chalybeate qualities; nor does it lose them entirely even by being exposed to a boiling heat. A quart boiled to half a pint deposited an ochreous sediment, but still gave marks of a vitriolic water, and with powder of galls changed slowly its colour, and, after eighteen hours, it exhibited a faint blue. The water, after being boiled to half a pint, had a harsh and more aluminous taste than the fresh water.

This water is observed to be stronger after rain, than after a course of dry weather; for a quart in a rainy season yielded nine grains of a whitish salt, which on trial proved to be a true sal martis, and more than one grain of an earth; after five or six weeks of dry weather, a quart only yielded five grains and a half of salt, and about one fourth of a grain of earth. Dr. *Horseburgh* suspects, that the salt contains rather more acid than the common sal martis; for it strikes

strikes a blue colour with galls, and not a reddish inclining to purple, as the solution of the common sal martis does. He likewise from its taste suspects it to contain a small admixture of alum, but that to be in so small a portion as neither to afford any chrystals of this salt by evaporation, nor to coagulate milk. However, what was formerly said of alum, should seem to render this fact extremely doubtful.

Though some of the acid of this water be in a volatile state, as appears from its dropping an ochreous sediment by being exposed to the air, yet the greater part seems to be of the fixed kind, from its still retaining its taste and chalybeate quality after being brought to a boiling heat.

This water is recommended in variety of disorders. In cases of internal hæmorrhages, such as immoderate discharges of the menses, in the hæmoptœ, in the dysentery, in cases where patients make bloody urine; in the fluor albus and in gleans; and it is even said to have cured two consumptions which were in their first stage. It has been recommended in complaints of the stomach and bowels; and it has been used with advantage

advantage in curing itchy hot tetrous eruptions and old sores, when applied externally, and taken at the same time as an internal remedy.

This water is drank from a gill to a pint, or even to two pints, at repeated draughts, in the morning.

IRISH WATERS.

CROSS TOWN,

Situated about two miles and a half from the town of WATERFORD, in the county of WATERFORD.

This spring affords a water which approaches nearly to the Hartfell. Dr. Ruddy examined it after it was transmitted to Dublin. It gave a deep blue with galls; and did not lose its taste or chalybeate properties by heat.

Milk was not curdled with the water of one sample, though it was by that of three others; and though soap was curdled with one parcel, yet it lathered smooth with two others.

Evaporated,

Evaporated, a gallon yielded on a medium forty grains of an olive coloured and partly green whitish sediment, of an acid, austere, ferruginous taste, which Dr. *Rutty* calls a native white vitriol; but which, I think, should be more properly called a vitriolum martis.

This water vomits some, purges others, and with others it only proves diuretic.

From the effects with soap this water should not seem at all times to contain so much acid as the Hartfell, though at others it appears to be stronger and coagulates milk, which the Hartfell does not.

N O B B E R,

In the county of MEATH,

Is a vitriolic water of the same kind, which yields one hundred and seventy grains of residuum from a gallon by evaporation.

C A S H M O R E,

Situated in the county of WATERFORD,
and near to the CROSSTOWN water,

Is of the same kind but stronger; a gallon yielded forty-eight grains of a native vitriol.

K I L-

KILBREW,

Situated in the county of MEATH,

Is a good deal of the nature of the Shadwell water, being strongly vitriolic and yielding a larger quantity of solid contents than it. It is the rain water which passes through a black earth strongly impregnated with a vitriolic matter, collected in hollows and furrows, which was examined by *Dr. Ratty*.

This water had the strong vitriolic taste, and like the Shadwell water, neither lathered nor curdled with soap; but coagulated with milk when cold; it struck an intense dark blue with galls; and gave iron a blue colour with deep copper coloured streaks, after it had lain in it for some little time; which, *Dr. Ratty* thinks, gives a suspicion of a mixture of copper.

It retained its vitriolic qualities after being exposed to a boiling heat; and the water drawn off by distillation gave no indication of an acid.

Different parcels of this water evaporated, yielded from eleven hundred and sixty-eight

eight to sixteen hundred and ninety-six grains of sediment from a gallon ; and hence the Doctor reckons, that a gallon on a medium yields fifteen hundred and thirty grains, or three ounces, a drachm and a half.

This residuum is mostly a true vitriolum martis, highly saturated with an acid. The Doctor says, the salt is above thirteen times more than the indissoluble matter ; though, in another place, he mentions the insoluble matter being only $\frac{1}{24}$ part.

The salt, left to itself, liquefied in the air ; it curdled milk, and effervesced with alkalies ; and it corroded mutton that was boiled with it ; and from hence he concludes, that the acid was prevalent in it.

The Doctor suspects, that this water contains a very small admixture of alum, tho' he could not demonstrate it by any experiments.

This, like other strong vitriolic waters, must be used with great caution ; patients ought to begin with drinking a small quantity, and gradually increase the dose.

Half a pint vomits and purges.

It is said to have cured the fluor albus, uterine hæmorrhages, obstinate intermittents, and even an inveterate dropsy.

FRENCH WATERS.

VAHLS, in DAUPHINY,

This water, according to *Du Clos's* account of it, belongs to the class of vitriolic waters. In his *Observ. de aquis mineralibus*, class vi. he says, that it is clear and limpid, and tastes somewhat like white wine, in which a little vitriol has been dissolved.

With galls it turned of a black colour, with a blueish cast; and became green with oil of tartar, and turned the liquor of tourn-sol of a red purple.

When heat was applied, it lost its original taste; though it still was sour and tasted of iron.

Evaporated, it left in the proportion of sixty-one and a half grains of sediment from a gallon, which was of a brownish white colour resembling somewhat calcined vitriol. Common water, in which some of this salt

was dissolved, became black on mixing it with a solution of salt of tartar, and a precipitation ensued.

Du Clos observes, that those who drank it, found it to lie heavy on the stomach; and that it both vomited and purged them, and tinged their stools black.

R U S S I A N W A T E R S.

O L O N E Z,

About thirty miles from the city of OLO-NEZ, situated (on the opposite side of LAKE LAGODA from PETERSBURGH) in the province of NOVOGROD,

Is a water, which, by evaporation, yielded a true martial vitriol: the analysis, as related by *Dr. Reiger*, is not so distinct as could be wished.

A gallon yielded about a drachm of sediment, of which about a third part was an ochreous earth or iron, the other two thirds a vitriolum martis, which is alledged to be combined with an alkaline salt.

This water is very limpid at the fountain, and raises no effervescence with either acids

acids or alkalies. It has no colour or smell, and has an astringent, slightly ferruginous, and vitriolic taste.

These waters generally keep the belly open, yet sometimes bind; and they operate largely and expeditiously by urine, and seldom excite vomiting.

They sit light on the stomach, even though drank to pints.

From the account of this water, it is probable that it is a brisk spirity water at the fountain head; and from its yielding such a quantity of ochreous matter by evaporation, it is certain that a great part of its acid is in a volatile state.

SPANISH WATERS.

R I O T I N T O,

In the Province of ANDELUSIA.

From the account of Mr. *Pet. Jonas Bergius*, in the *Swedish Transactions* for 1761, it is probable that the waters of this river belong to this class; for he says, they contain a great deal of iron and a fixt vitriolic acid,

and a little common salt; that they have a very nauseous and inky taste, and are better for making ink than any other solution of vitriol. They are recommended in dropfies, and operate as an emetic, taken in quantity.

S E C T. II.

OF CHALYBEATE WATERS,
FROM WHICH LITTLE
OTHER SOLID MATTER
THAN AN OCHREOUS
EARTH HAS BEEN GOT;
AND OF SOME CHALY-
BEATES, WHOSE SOLID
CONTENTS HAVE NOT
HITHERTO BEEN ACCU-
RATELY EXAMINED.

THERE are but very few chalybeate waters, which have not a small portion of some saline matter, or earth in their composition, besides the iron. Mr. Boyle, in his *Short Memoirs for the natural experimental History of Mineral Waters*, page 90 says, that he found marks of sea salt in all the *English* waters he had occasion to try,
not

not one excepted; and, indeed, almost every one, since examined, has been found to contain either some portion of it, or of a calcareous Glauber salt.

At present we shall only consider a few of those, which contain so little of other solid matters, that their virtues principally depend on their chalybeate qualities, or their fine volatile principles. They are generally weak chalybeates; are drank in large quantity, to one, two, three, four, or more pints; and they operate principally by urine, seldom by stool, or as emetics, except when drank in such large quantities, that plain water of itself would probably have produced the same effects.

It would be an endless work to take notice of all the chalybeate waters, that belong either to this, or most of the other classes of chalybeates we are to consider, as they are so numerous in every county in this island, and almost in every country.

262 CHALYBEATE WATERS.

Those we shall take notice of at present are,

ENGLISH.

HAMPSTEAD.
CARLTON.
ISLINGTON.
LEEZ.
MARKS HALL.
FALSTEAD.
WELLENBROW.
AYLESHAM.
MALVERN.
COLURAIN.
HARRIGATE.
BIRMINGHAM.
CANNOCK.
MOSS HOUSE.
WIGAN.
SENE OR SEND.
KERN KEY.

SCOTCH.

PETERHEAD.
ABERBROTHOC.
GLENDY.

IRISH.

COOLAUAN.
BALLYCASTLE.
GLANMILE.
KANTURK.

DUNNARD.
WEXFORD.
BALLYSPELLAN.

FRENCH.

CARENSAC.
LANGUEDOC.
PROVINS.
DE POUGE.
DE CHARTRES.
ST. PAUL.
BOURBEROUGE.
PONT NORMAND.
MONTBOSQUE.
HEBERREVON.
APOUGNY.

SPANISH.

TOLEDO.
VALENTIOLA.
ALMAGRA.
BOLAGNUM.

ITALIAN.

RECOBAR.
PIZZO.
BAIA.
ISLAND OF ILLUA.

GERMAN.

GERMAN.

RADEBERG.
LAUCHSTADT.
BEBRAN.
FREYENWAND.
WEISENBERG.
HELMSTADT.
POLZIN.
FURSTENAU.
STADTHAGEN.
GOEHPPENGAM.

STEBEN.

NESDENICE.
ZAHOROVIC.
SUCHALOZA.
WILDBAD.

HUNGARIAN.

NEWLUBLOU.

PRUSSIAN.

OTTLAVIAN.

The acid is of a more fixed kind in some of these waters, than in others; for some of them retain their chalybeate qualities, after being kept for weeks, and bear carriage from one place to another, while others lose their property of tingeing with galls on being carried to a very small distance, or being kept for a very short time. It is remarkable of these, as well as of almost all other chalybeate waters, that, after they have lost their ferruginous taste, and property of tinging with galls, if they be kept till a putrefaction or fermentation begins, they again recover both their chalybeate taste and property of tingeing with galls; which, as we before observed, seems to be owing to the fermenting process dis-

engaging part of that acid which was united to the phlogiston, and other matters in the waters, and by these means furnishing a new menstruum for the ochre or iron which had been precipitated. Like other chalybeates, they depofite an ochre in the bottom of their basons or wells, and throw up a blueish variegated scum.

E N G L I S H.

H A M P S T E A D,

In the county of MIDDLESEX,

Is a transparent chalybeate water, lighter than distilled water, which bears carriage, and retains its chalybeate quality, after having stood six hours in uncorked bottles: Dr. *Soame* says^a, that though in one trial made by Mr. *Brown*, the water, when warmed, gave no tincture with galls, yet in others made by himself, it gave a fine purple, when just ready to boil.

The Doctor tells us that Mr. *J. Brown* says, that with fyrup of violets it be-

^a See Dr. *Soame's Hampstead Wells*, published in the year 1734, page 100 and 108.

came purple, which, if true, shews an acid to be prevalent.

Half a grain of galls in half a pint of water turned it to a fine crimson in about five minutes, and continued so for four or five days in an open glass.

In the trials that I made with this water at the fountain, three drops of a strong infusion of galls struck a fine crimson colour, and fifteen drops, after standing some minutes, brought it to a fine transparent dark red purple.

A solution of silver, in spirit of nitre, gave a white cloud.

A solution of common caustic, and of salt of tartar in water, and spirits of hartshorn dropt into the water, made no visible change, but mixed smoothly.

Syrup of violets, mixed with the water, kept its blue colour for some minutes, and then changed to a light green; but I could not observe that it gave the water the least reddish colour on mixing.

It was lighter than New River water that had been boiled, but heavier than distilled water.

Distilled,

Distilled, Dr. *Soame* says, a gallon yielded between five and six grains of a kind of saline concretion, mixed with a yellowish earth, and had a taste somewhat like vitriol of iron. Hence we see that this is a pretty pure chalybeate, whose acid is of a fixed kind, and perhaps it might have been ranked among the weak vitriolic waters.

Mr. *Boyle* mentions his having discovered marks of sea salt in it.

The common operation of this water is as a diuretic; it is drank from half a pint to pints.

C A R L T O N,

Situated near to NEWARK upon TRENT,
in the county of NOTTINGHAM,

Is a chalybeate, which Dr. *Short* (vol. 2d. page 40.) says, weighs thirty grains in a pint lighter than common water, and retains its chalybeate qualities after being kept some weeks. It has a fetid smell, like to infusion of horse-dung.

ISLING.

ISLINGTON,

In the county of MIDDLESEX, near to
LONDON.

Is a light chalybeate, which soon loses its tinging quality: with galls this water strikes a crimson, which heightens to a red purple, and at length to a muddy and blackish.

I examined this water at the spring, and it had a pleasant chalybeate taste, but it exhibited no air bubbles when taken up from the fountain in a glass; both the fixed and volatile alkalies made it lose a little of its transparency, but did not cause any cloud; it weighed lighter than distilled water; the other trials answered to those already mentioned.

Mr. *Boyle* says, he discovered marks of sea salt in it, and that it became a little milky with the fixed alkalies.

Evaporated, a gallon yielded of a reddish earth, in one trial, ten grains, in another sixteen, and in a third thirty, as Dr. *Linden* mentions, in treating of this water.

This

This is one of the lightest and best chalybeate waters about London, and was formerly in great repute.

L E E Z, in ESSEX,

Near the earl of MANCHESTER'S.

At this place there is a chalybeate water ^c, which strikes a blueish black with galls, but loses this property in twenty-four hours; it rendered a solution of saccharum saturni milky, and it gave a pale yellow with lignum nephriticum.

M A R K S H A L L, in ESSEX,

A chalybeate water, which gave a bright red, with a very little of a purplish cast to galls, which it lost in two days after, without any precipitation of its ferruginous parts, in which it differs from other chalybeates.

^c This and the five following are all mentioned by Dr. Benjamin Allen, in his *Natural History of the chalybeate and purging waters of England*.

F E L S T E A D,

At the bottom of a rock in the same
county,

A light chalybeate, which became milky
with a solution of saccharum saturni, and
suffered no stain from lignum nephriticum.

WELLENBROW, in NORTHAMP-
TONSHIRE,

Is a light chalybeate, which struck a
violet colour with galls, and a deep green
with syrup of violets. It weighed at the
spring eighteen grains in twelve ounces
lighter than common water.

AYLESHAM AND OULTON,

In the county of NORFOLK.

Aylesham is a chalybeate, which strikes
a blueish black with galls; and that at
Oulton is a lighter water of the same kind.

M A L V E R N,

Situated about a quarter of a mile below this village, in the county of GLOUCESTER.

This water is a light pleasant chalybeate.

Dr. *Wall* says, that at the spring-head it instantly strikes a purple with galls, and if carefully taken up and close corked, will retain the same property for several hours.

It mixes smoothly with acids and alkalis, and they produce no change; with a solution of silver it causes at first no milkiness, yet by standing some time it grows gradually whitish, and then muddy and of a reddish purple, at last a powder of a deep purple colour is precipitated; a solution of soap produces a very pale pearl colour, but without curdling in the least.

Evaporated, two quarts yielded one grain of earth, one grain of iron, and nearly the same quantity of a muriatic salt, which grows moist in the air, and therefore appears to be bitter.

C O L U R I A N,

In the parish of LUDGVAN, in CORNWALL.

Dr. *Borlase*, in his account of Cornwall, mentions several chalybeates, but the most remarkable seems to be that of this place, which turns to a deep reddish purple with galls, and with green tea to a lighter purple.

Syrup of violets mixed with this water retained its usual colour towards the top, but turned of a pale greenish colour towards the middle, which reached within half an inch of the bottom, and the remainder was of a light purple. It mixed smoothly with salt of tartar, and did not affect the colour of silver. A variegated pellicle gathers on the surface of the well. On the 7th of August 1734, it was almost blood-warm, when a neighbouring spring was as cold as ice. It is in much repute in the neighbourhood.

H A R R I G A T E, In YORKSHIRE.

Between *Harrigate* and *Knareborough* are several chalybeate waters, which Dr. *Short* gives

gives an account of, in his first volume on mineral waters; the most remarkable are, the *Alum Well*, the *Sweet Spaw*, and the *Tuewhet Well*.

The *Alum Well* in the Bogg is a chalybeate, which gives a dark purple with galls, and, when evaporated, a gallon yielded about eight grains of a dark brown sediment; it had a rough vitriolic taste, and curdled milk.

Sweet Spaw, called so in opposition to the sulphur wells, from which it lies above a quarter of a mile distant to the south, is a chalybeate water, which strikes a light red purple, when six drops of tincture of galls are mixed with a glass-full of it.

It retained somewhat of its chalybeate property, after standing sixteen hours exposed to the open air.

As it sprung from the earth, it was twelve grains in the pint lighter than common water.

Evaporated, a gallon yielded at one time a scruple, and at another only eight grains; of which above one half was earth.

The *Tuewhet Well*, situated about a quarter of a mile south of the other, is a chaly-

chalybeate, which gives a deep violet colour with galls; and was thirty-two grains in the pint lighter than common water, as it rose from the earth, but turned heavier by standing. Evaporated, a gallon yielded at one time thirteen grains, at another nineteen grains of sediment; of which three fifths were a calcareous earth, the other two fifths, set to chrySTALLIZE, projected chrySTALS of calcareous Glauber salt.

Both these waters, the *Sweet* and the *Tuewhet*, mix smoothly with milk, but curdle soap, and they are colder than common water. The *Tuewhet* has the strongest chalybeate taste, and gives stronger marks of a ferruginous impregnation than the *Sweet*, and it loses its chalybeate properties sooner, when either exposed to heat, or to the open air; it is also lighter as it rises from the spring, and its acid seems to be more volatile, and the water to be brisker and more spiritity than the *Sweet*. Dr. *Short*, in his late treatise, alledges they strike a rose purple, then a blue, and presently a green, with syrup of violets.

B I R M I N G H A M,

In the county of WARWICK.

Near to this place, Dr. *Short* (vol. ii. p. 43.) says, is situated a brisk chalybeate water, that has but an inconsiderable portion of solid contents.

C A N N O C K,

Near to STAFFORD.

Dr. *Short* says, (vol. ii. p. 43.) this is one of the best and lightest chalybeates in Staffordshire; it loses its chalybeate qualities in two or three days.

M O S S H O U S E,

Near MAUDSLEY, in LANCASHIRE,

Is a light brisk chalybeate, which, Dr. *Short* says, becomes as heavy as common water by carrying a mile; a gallon, evaporated, yielded him (vol. ii. p. 38. and 130.) twenty-three grains of sediment; eighteen grains were an ochreous earth, the other five grains a salt, the nature of which he does not mention.

W I G A N,

W I G A N,

In the same county as the last,

Is a clear chalybeate, which, by evaporation, yielded Dr. *Short* (vol. ii. p. 30. and 130.) twelve grains of sediment, composed of ochre and a calcareous Glauber salt.

S E N E or S E N D,

Three miles from the DEVIZES, in
WILTSHIRE.

Guidott & mentions two springs here; the water of the one was a very strong chalybeate; it struck a dark purple or black with galls; it bore carriage to London, and he obtained about a scruple of ochre from the gallon, but no salt: it may, on further trials, be found to deserve more the name of a vitriolic than chalybeate water. The other was not so strong; it only struck a red with galls, and lost its tinging quality in forty-eight hours. These waters are diuretic, but not purgative.

* De Thermis Britan. 1691. pag. 405.

In the same district, near to Send, is another chalybeate, at a village called Paulsholt.

K E R N K E Y,

Near REDRUTH, in CORNWALL.

Dr. *Borlase* mentions a water at this place, which he says one Mr. *Vallack*, an apothecary at Plymouth, examined, and affirms that it contains both iron and tin. However, this fact may be doubted till further trials are made; and if it should prove true, it is the first water of the kind which has been observed.

L L A N D R I N D O D,

In the county of RADNOR, in SOUTH WALES.

In this parish is a chalybeate water, which is clear and transparent as taken up from the fountain, but changes to a pearl colour by standing; while it preserves its pellucidity, it has a strong chalybeate taste and smell, but it loses both so soon as it changes its colour.

Dr.

Dr. *Linden* says, at the spring head it becomes of a deep purple with powder of galls, and green tea, but loses its tinging quality after it has been carried to the long room, and stood an hour.

It excites a fermentation, or ebullition, by being mixed with rough cyder and sugar, as it is taken up from the fountain; it becomes white as milk with oil of tartar and volatile spirits, but turns gradually to a yellow colour, inclining to a green; and it does not curdle milk. His account of the solid contents, obtained by evaporation, is very indistinct; but it should seem, upon the whole, to be a strong chalybeate, which contains some neutral salt, or calcareous earth.

SCOTCH WATERS.

Although there is scarce a parish in Scotland without one or more chalybeate waters, yet there are but few of which we have any particular account, or just analysis.

P E T E R H E A D,

In the county of ABERDEEN,

Is one of the most famed chalybeates, to which the people of that county resort, and is reckoned the strongest in that part of Scotland.

G L E N D Y.

The waters reckoned next to Peterhead are the Glendy, and Kincardine, in the county of Mairns.

A B E R B R O T H O C K.

And the Aberbrothock, which yields by evaporation, from eight to ten grains of sediment from a gallon.

I R I S H W A T E R S.

C O O L A U R A N,

In the county of FERMANAGH,

Is a chalybeate which strikes a purple with galls. It has an ironny, but not disagreeable taste, and bears carriage.

Evaporated,

BALLYCASTLE. 279

Evaporated, Dr. *Rutty* says, a gallon yielded twelve grains of sediment, which grew moist by being exposed to the air.

BALLYCASTLE,

In the county of ANTRIM,

Is a water impregnated with iron, which bears carriage. It gives a deep purple tending to the violet with galls; it has a strong ferruginous taste and fetid smell; after curdling a little with soap, it lathered with it.

Oil of tartar exhibited only a subtile whitishness, and a solution of silver a small subsidence; and hence it contains but little calcareous earth, or sea salt.

Evaporated, a gallon yielded twenty-one grains of a brown ochry coloured sediment, of a brackish taste, which made an ebullition with vinegar, and sparkled much on the red-hot iron.

GLANMILE,

Situated near NAUL,

Is a chalybeate, which loses its tinging quality in less than three days. At the foun-

tain it lathered smooth with soap, and struck a claret colour with galls at the fountain.

Evaporated, a gallon yielded ten or twelve grains of sediment, of a brackish or bitterish taste, which grew damp in the air, and fermented with oil of vitriol, and was a little attracted by the magnet, even without calcination.

K A N T U R K,

In the county of CORK,

Is a chalybeate which has a disagreeable nauseous smell and taste, and is alledged to tinge silver of a copper colour, when taken immediately up from the well; with galls it struck a deep crimson colour at the fountain; it did not curdle with soap, but lathered smoothly with it, and gave no cloud with oil of tartar.

Evaporated, Dr. *Rutty* says, a gallon yielded five grains of a residuum of a yellowish colour and brackish taste, which was partly attracted by the load-stone before calcination, and very strongly afterwards.

D U N N A R D,

Situated eighteen miles from DUBLIN,

Dr. Ratty says, is a chalybeate which has a rough ferruginous taste, which it retains above twenty-four hours.

It struck a deep purple with galls, gave no cloud with oil of tartar, though it did with a solution of silver.

Evaporated, a gallon only yielded three grains of an ochreous brown, and little saline sediment.

W E X F O R D,

Is an agreeable ferruginous water, which, with alkalies, either remained clear or turned a little yellow, and with a solution of silver exhibited a white cloud.

Galls at the fountain struck a deep purple, and syrup of violets retained its blue colour long, but turned greenish in forty-eight hours.

It lost its chalybeate quality after keeping for a day or two.

Evaporated, *Dr. Ratty* says, a gallon yielded nineteen grains of a dark brown ochreous sediment,

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sediment, which had an obscure bitterish and brackish taste. It soon grew damp in the air; and it effervesced with acids. The Doctor thinks there is an absorbent earth and sea salt united to the ochre in the sediment.

BALLYSPELLAN,

Situated eight miles from KILKENNY,

Is a light chalybeate which soon loses its tinging quality; evaporated, a gallon yielded four grains of residuum.

FRENCH WATERS.

CARENSEAC.

Situated at CARENSEAC, in the Low ROUERGE.

Mr. Lemery, in the *Memoirs of the Academy of Sciences for 1705, Hist. page 85, Edit. 8vo.* mentions a water impregnated with iron, which seems to deserve to be examined more particularly: he says, it has a sharp vitriolic taste, and that, by evaporation, he got eighteen grains of a grey salt,
a lit-

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a little vitriolic from twelve ounces of the water, which is in proportion of one hundred and ninety-two grains from a gallon.

This water should probably be ranked among the vitriolics, or in some of the classes we are to examine afterwards; but for want of a more particular description, we have placed it here.

L A N G U E D O C.

Monf. Sauvagenⁿ, in the *Mem. de l'Acad. des Sciences à Paris* for 1747, mentions two chalybeates. 1st. *La Rogne*. 2d. *Daniel*; which, he says, are esteemed for the cure of the dysentery, and other disorders.

P R O V I N S,

Eighteen leagues from PARIS,

Is a chalybeate which tastes of iron. *Du Clos* says, that evaporated, it yielded $\frac{1}{1194}$ part of a sediment composed of an earth and salt.

ⁿ *Comment. de reb. gestis in medicis, &c. Lipsiæ, vol. ii. p. 235.*

D E P O U G E.

In the NIVERNOS,

Is an acidulous chalybeate which loses its taste, and becomes effete by keeping.

DE CHARTRES EN BAUSSE.

The water at this place is a brisk spirity chalybeate, which gives a blackish colour with galls at the fountain. Evaporated, *Rieger* says, eight pounds yielded only a scruple of sediment, four grains of a sharp salt, and sixteen of a brown earth.

ST. PAUL DE ROUEN,

In NORMANDY,

Is a chalybeate water which drops a fine ochre in the channels. *Du Clos* says, in evaporating, there floated a yellowish mucus, and it left a small quantity of a brown ochre behind.

BOURBEROUGE, MENITOUË,
PONTNORMAND.

Du Clos tells us, that near to Mortain in Normandy are the waters of Bourberouge, Menitouë, and Pontnormand, which, on trial, prove to be simple chalybeates, which contain but a very small quantity of any solid matter.

MONTBOSQUE,

In the Election of BOYEUX,

This water, *Du Clos* says, is very limpid, and has a little of a ferruginous taste; and evaporated, it left a small pittance of a brown earth, which tasted salt.

HEBERREVON AND APOUGNY.

Du Clos mentions likewise two other plain chalybeates, one at *Heberrevon*, near St. Lo, and the other at *Apougny*, near Seignelay in Bourgogne.

S P A N I S H W A T E R S.

T O L E D O,

Three miles from TOLEDO, in the way to
GRANDA,

Baccius says, there is a sharp acidulous water, which loses its sharpness by keeping two or three days.

V A L E N T I O L A,

In the bishoprick of TOLEDO, near the River ANA, in the district of VALENTIOLA,

Is a sharp water, which, from the accounts given of it by *Baccius*, should seem to be a brisk chalybeate.

A L M A G R A A N D B O L A G N U M,

In the province of CASTILE, four leagues from ORETO.

The water at *Almagra*, mentioned likewise by *Baccius*, seems to be of the same nature as that of *Valentiola*. He says,
there

there is a sharper water of the same kind in the confines of the province, at the village of *Bolagnum* (*ad Bolagnum Pagum*).

ITALIAN WATERS.

R E C O B A R,

In the VENETIAN territory (in VICETINA REGIONE,)

Baccarius * tells us in the *Instit. Acad. Bonon. Tom. 3. 1755*, that it is a brisk chalybeate which abounds with a mineral spirit, and the sediment left after evaporation was made up of an alkaline or calcareous earth and selenite.

PIZZO OR LUCULLIAN,

Without the town of NAPLES.

On the sea coast to the right stands the Lucullian Hill, now called Pizzo Falcone, on which, *Baccius* says, there is a great number of springs. On the south side, where it is rocky, and runs out into the sea,

* Ibid. vol. v. page 306.

are two springs of mineral waters of nearly the same nature.

The one on the right is limpid as it rises from the spring, but, on standing, soon becomes whitish. This water has a sharp acidulous styptic, but not ungrateful taste, has a fetid smell, and feels somewhat fat or oily.

The one on the left rises whitish, has a smoother, more oily taste, and is not so sharp.

They both drop a quantity of ochre in their wells and channels through which they run; and evaporated to dryness, there remains a very fine white powder.

They operate both by stool and urine, but principally by urine; and they sometimes vomit.

B A I A.

In the country of Baia, and every where in that neighbourhood, are a number of chalybeate waters.

ISLAND OF ILLUA.

In this island, situated in the Tyrrhenian sea, are several sharp acidulous chalybeates.

GERMAN WATERS.

Although there are so many common chalybeate waters in Germany, yet we have not a particular account of a great number. *Hoffman*, in his treatise *de præcipuis medicatis fontibus Germaniæ* §. 25, mentions the following:

Radeberg, near Dresden.

Lauchstad, in Misnia, three miles from Lypfick.

Bebran, in Thuringia.

Freyenwald, in the March.

Wisenberg, in Franconia.

He says, they are all chalybeates, which, when carefully examined, are found to contain no other effective matter that is visible, except a very fine crocus of iron, commodiously received and harboured in an exceeding light and elementary water. He adds, this spirit does not evaporate, nor are

they alkaline, for mixed with fyryp of violets, they do not turn it green, though they give a black purple with galls, and depofite their ochre when expofed to the air, or to heat.

HELMSTADT,

In the duchy of BRUNSWICK,

Is a brisk chalybeate, which neither sparkles fo much as the Prymont, nor has fo brisk a tafte. *Dr. Ph. Con. Fabricius*^r fays, it abounds with a volatile acid; and that, evaporated, it yields in the proportion of above fixty grains of fediment from the gallon, ten and a half grains of an alkaline falt, ten felenite, and forty-two of ochre, mixed with an oily matter.

POLZIN,

Situated in POMERANIA,

A brisk chalybeate, which Dr. D. G. *Thebesius* fays, contains an alkaline earth. See his account in *Nov. act. Phytic. medic. A. N. C.* for 1757.

^r Ibid. vol. vi. page 19.

FURSTENAU,

Two miles from BRUNSWICK,

Is a very light chalybeate water, which, Dr. *Reiger*^d says, yields but very little solid contents by evaporation, to wit, about ten grains from nine pounds of the water.

STADTHAGEN,

In the country of SCHAUMBERG,

On the confines of Hanover, in Westphalia, Dr. *Rieger* says, there is a chalybeate water.

GOEPPENGAM,

In the duchy of WIRTENBERG, four miles from STUDGARD,

Is a chalybeate water which makes an ebullition with acids, exhibits a white cloud with alkalies, turns milky with a solution of saccharum saturni, and green with syrup of violets.

² See *Rieger Introduct. in Notitiam, &c.* from Dr. *Jo. Carspie's Examen Aq. miner Furstenau*, Helmstadt 1724.

It becomes of an obscure purple with tincture of galls, but boiled with them, it acquires a black colour.

Evaporated, Dr. *Rieger* says, it left a small matter of a calcareous earth, mixed with a small portion of a neutral salt.

JEBENHUSAN.

Dr. *Reiger* says, that about half a league from GEOPPENGAM, there is a place called Jebenhufan, where there is a spirity chalybeate, which contains an alkaline earth and neutral salt.

STEBEN,

In FRANCONIA, half a mile from the town of LICHTENBERG, at STEBEN,

Is a chalybeate which tastes a little inky.

Dr. *Thomas Jordan*, in his treatise on the mineral waters of Moravia, published in the year 1586, gives an account of the three following Acidulæ.

NEZDENICE,

About half a mile from HUNNOBRODA,

Is the village of Nezdénice, in the district of the castle of Banow; and near to this is a spring of a very limpid acidulous water, which is in great repute among the country people of the neighbourhood, for the cure of most distempers. It has no other taste but that of an acidula, except a very slight degree of saltiness. Boiled, it exhibited a froth or scum, which he says smelt aluminous or nitrous; and when the water was totally evaporated, some blisters arose on the surface of the sediment similar to those which rise on melted alum; and when it was removed from the fire it was very white, and appeared porous and frothy.

Part of the residuum put on a red-hot iron decrepitated, and first appeared white, and then brown, and tasted saltish and somewhat urinous.

Z A H O R O V I C E,

Not far from the last named water, beyond the village of ZAHOROVIC, in the district of the CASTLE of SUIETLOVIA, in a rocky valley by the side of the river NEZDENICE,

Is another acidulous water, which has been very much esteemed, particularly for the cure of scrophulous disorders. It is much salter, but less acid than the Nezdenice water ; and it tastes likewise somewhat pungent and fetid.

Boiled, it left a white fæces, which had a good deal of the taste of the water.

Distilled to driness, it left a black grumous matter, resembling exactly the sea salt that is got by the side of the Adriatic Sea, in blackness as well as in roughness and saltishness ; and it had something of an uncommon fetid smell.

Thrown on a red-hot iron it decrepitated strongly, and went into grumes ; and part of it became more black, and part white ; it emitted no smoke, and it became salter and more acute and purgent.

SUCHA-

S U C H A L O Z A,

About a mile from HUNGARIAN BRODA,

Near to which is an acidulous water, that is greatly esteemed by the neighbourhood, and much drank to victuals, in place of wine and small beer.

It has an acidulous taste of a middle degree, between that of Nezdenice and Zahorovice, and likewise a small degree of astringency, but not the least fetid smell or taste, though its sediment had a great deal.

The sides of the well had a quantity of a reddish brown earth adhering to them, which had a fat acid taste.

The sediment, which remained after distillation, had a disagreeable smell, like to bitumen or asphalt; an extremely salt and somewhat astringent taste; a black colour, and felt fattish, when rubbed between the fingers: and in the bottom of the glass vessel, under a thick fæculent matter, was a thick putrid liquor, resembling an oil.

The sediment thrown on a red-hot iron crackled, and emitted a fetid smoak, and

then burnt to a coal. The oily part melted on the plate, then contracted itself, and hardened into a stone or coal. The brown or clayish part had a very sharp taste, and when held in the mouth, impressed a kind of stupor on the teeth.

D A S W I L D - B A D,

Situated within the walls of the town of
NUREMBERG.

Dr. *Rieger*^t says, this water has a sub-astringent taste, is clear and pellucid as drawn from the well, but becomes pale by standing; it covers its well and channels through which it runs with a yellow crust. He says it stains the linen of the drinkers of a yellow colour, and seems to contain ochre mixed with a saline matter. It has been recommended in obstructions of the viscera, and in female complaints.

Gumtberius, in his *Commentarius de balnies et aquis medicatis*, published in 1565, mentions a great number of acidulæ which are to be met with in Germany, particularly in Swabia and Wirtemberg, and in the

^t See Reiger's *Introd. in Notitiam*, &c. Art. de Acidulis.
countries

IN SWABIA AND WIRTEMBERG. 297

countries situated near the Rhine; but as in his days chymistry was in its infancy, and the proper methods of discovering the nature of mineral waters were unknown, we cannot depend on what he says with respect to their contents, or even that they are all chalybeates, and therefore I shall only give the names of some of those he mentions.

IN SWABIA AND WIRTEMBERG.

One near *Geisslingen*, in the district of Ulm; a remarkable one near Rottemberg on the Necker, at a village called *Nideraw*; and two others near it, which are used as baths.

Two in the district of *Deinach*, near the town of *Kalw*, a very grateful acidulous water among the mountains Apud Rhetos.

One at the village of *Antegast*.

IN A L S A C E.

One at *Gebertzweyler*: two in the district of *Hundsruck*; the one near *Byrckenfeldt*; the other near *Leaningen*, not far from the town of Symmern.

Near

Near the River MOSELLE.

Three near the city of Triers. 1st. At the convent of *St. Mathia*. 2d. On a mountain near the village of *Longuich*. 3d. At *Wettersdorf*.

One in the vale of *Bellertthal*, near the castle of *Leyen*.

Two at the castle of *Loborn*, near the Moselle; the one called *Oberborn*, the other *Underborn*.

One beyond the Moselle at the little town of *Wymmenger*, at the vale of *Conderthat*.

One at *Bassenheim*, near the castle of *Waldbot*.

One at the village of *Kerlech*.

One called *Resselborn*, at *Mendich*, from the noise it makes.

In the bishoprick of COLOGNE.

One called *Ponterborn*, near the town of *Andernach*, which rises with a noise, and is pleasant and agreeable. Not far from this is the one called *Heylborn*; and near this the *Antobian* or *Tonstein*, which we
formerly

formerly mentioned as a water containing the fossil alkali, from *Hoffman*. And near this the four following. The *Falborn*, which springs up in the middle of the rock. The *Nickenkleetz*, in the meadows. The *Broylerborn*, in the village Broyl. And the *Brocherborn*. To the left of this the *Resselborn*.

Two at *Olbruct*. Two at *Webr*. And three on the banks of the Ahr.

In the bishoprick of TREVES.

In the district of *Eysalia* four. 1st. *Daun*. 2d. *Lentzogsbrun*. 3d. *Hotserbrun*. 4th. *Daunerbricker*. And one at *Montebaur*. One at *Megen*. And one at *Saltzbron*.

One at *Angria*, in the district of *Ravensberg*.

Two at *Nederlanstein*, near the river Lan; and two near the Embs Baths; two in Hefslan, *Brubach*, and *Danckelbron*.

Country of HANOW.

Five. 1st. *Carben*. 2d. Near *Ocarben*. 3d. *Rorsback*. 4th. *Schwalheim*. 5th. Near *Niedt*, which they call *Faulbron*; besides several others.

HUN-

HUNGARIAN WATERS.

NEW LUBLÓU,

In the county of ZIPSSEN, in HUNGARY;

Is mentioned by *Scrober*^s, in the *Hamburg Magazine*, vol. xiv. part 2. N^o 3. as a brisk spirity chalybeate at the fountain, but which does not bear carriage.

PRUSSIAN WATERS.

OTTLAVIAN,

Situated about a mile from MARIENWERDER
in PRUSSIA,

Is a very brisk spirity chalybeate, which has a slight sulphureous smell, and makes the head giddy on drinking. It becomes purple with galls, and green with fyrup of violets. It loses its spirit and becomes turbid and effete by being kept twenty-four hours, even in well stoppt bottles, according to Dr. *Rieger*, who takes his account from a treatise published on this water by Dr. *Mich. Frider Tennigs*, in *Prussian Regiomont*. 1727.

• Ibid. vol. iv. page 108.

SECT.

S E C T. III.

OF CHALYBEATES WHICH
CONTAIN A NATIVE ALCA-
LINE SALT.

THE next of the chalybeate waters we are to consider, are those which contain a native alkaline salt with iron. In general, the salt is in small quantity, and the common operation of the waters is by urine ; though, where the salt is in large quantity, and in particular constitutions, they sometimes operate by stool.

Most waters of this class, like other chalybeates, are more or less impregnated with volatile principles, which is known by their sparkling and throwing up air bubbles when taken up from the fountain ; and by their depositing their ochre, and becoming specifically heavier when exposed to the air, or to heat.

Those hitherto discovered in this island are not so brisk, nor do they seem to contain near so much of a fine volatile acid,

or

302 ILMINGTON OR BALEMORE.

or mineral spirit, as the Spaw and some others of the foreign waters do.

Those we shall consider at present are,

ENGLISH.	GERMAN.
ILMINGTON OR BALEMORE.	KUKA OR GUGGA.
THETFORD.	LIGNITZ.
LINCOMB.	BRABACK.
ROAD.	SULZBACH.
	SCOLLIENCES.
	SPAW.
	BERSTAD
	SCHWALHEIM.
	VETERAGENSES.
	LEIBENSTEIN.
FRENCH.	SWEDISH.
ABBECOURT.	DANNEMARKSBRUN- NEN.

ILMINGTON OR BALEMORE,

Situated in WARWICKSHIRE, on the
borders of WORCESTERSHIRE,

Dr. *Short* says, is a very fine and clear
chalybeate.

Dr. *Derham*, in his account of this water
published in 1685 says, it is in a ferment-
ing state at the spring head, and sparkles in
a glass, like bottled cyder newly emptied.

Oil

Oil of tartar exhibited some small coagulum with it; galls turned it at first purple, and on the addition of more galls it became black. This water bears carriage, and will keep in well corked bottles for a fortnight without dropping its ochre, but if exposed to the air, it drops it in less than twenty-four hours, and loses entirely its property of tinging with galls.

Evaporated, he says, it yielded a reddish white powder, which fermented and fumed with acids.

Dr. *Short* (see vol. 2d. p. 129) who analysed this water in 1733, tells us, that he got twenty grains of sediment from a gallon, nine grains of which were an ochreous earth, ten grains a salt, the nature of which he does not mention: he says (*ibid.* p. 43.) it is drank from one to four quarts.

From Dr. *Derham's* account, it should seem to contain an alkaline salt, though from Dr. *Short's*, it seems doubtful in what class this water should be placed.

THE T F O R D,

Situated in the county of NORFOLK,

Has a ferruginous taste and smell. Dr. Manning, in his treatise *de aquis mineralibus*, tells us, that with galls it struck first a purple, and then a black colour.

A gallon yielded by a spontaneous precipitation, nearly one drachm of an ochreous matter; and the water, after it had dropt this ochre, being exhaled to driness, yielded a pure alkaline salt, but he does not tell what the quantity was.

And he mentions an experiment in proof of its containing sulphur; he says, the ochreous sediment, digested with salt of tartar in alkohol, yielded a very red tincture, from which a hepar sulphuris was precipitated by the addition of juice of lemons; but this experiment seems very doubtful, and ought to be repeated with care, and the fact proved beyond a doubt, before we can ascertain the existence of real sulphur in these waters.

L I N C O M B,

Situated about half a mile from BATH,
in the county of SOMERSET,

Is a chalybeate which strikes a deep purple with galls; it loses its tinging quality in eight hours, if exposed to the air, and in two or three days in bottles; though it recovers it by putrefaction.

It is rather heavier than distilled water, and gives a white cloud with alkalies.

Dr. *Hillary* evaporated this water, and got from a gallon from sixteen to twenty-four grains of a pale cinnamon coloured sediment, which had a brackish taste.

Of this sediment, about $\frac{1}{6}$ or $\frac{1}{8}$ part was a saline matter, composed of natron and a calcareous Glauber salt; the rest seemed to be principally ochre, with a mixture of an oily matter, which the Doctor calls of a sulphureous or rather a bitumenous nature, and he compares it to the Geronsterre Spaw water; though to me it appeared to be only a common chalybeate from the taste, smell, and appearance, as it was taken up from the fountain.

R O A D,

Situatèd in WILTSHIRE,

Is a chalybeate which has a sulphureous smell, and presently gives a purple colour with galls, as taken up from the fountain, but does not bear carriage, and very soon loses its tinging quality.

Its gravity is nearly the same as that of common water, and it gave syrup of violets a grass green colour.

Dr. *Williams*, in his account of this water, mentions his having got from a gallon a drachm of sediment, which had a yellow colour, and a salt pungent taste; but Dr. *Clark* says, he did not get above half a drachm from the same quantity of water.

Dr. *Williams* says, that a drachm and a half of a salt, which had all the marks of the Egyptian natron, was got from half an ounce of the residuum. Though Dr. *Rutty* takes notice of Dr. *Clark*'s telling us, that the salt is a mixture of the native alkaline and marine salt.

This water on first using constantly gives one, two, or three stools in the day.

It

LIS-DON-VARN A. 307

It is recommended in scrophulous and scorbutic cases, and in cutaneous eruptions.

I R I S H W A T E R S.

LIS-DONE-VARN A,

In the county of CLARE.

Dr. *Rutty* gives the account of it, which was transmitted to him by Mr. *Sylvester O'Holloran*, surgeon, who examined it on the spot.

It has a strong ferruginous taste and smell, but is not fetid; and is of a whitish colour.

A grain of galls turned half a pint instantly red, then of a white purple, and at last of a blackish purple colour: two grains turned the same quantity instantly black.

It exhibited no whiteness with oil of tartar.

It did not ferment with oil of vitriol, but it grew clearer with acids.

Silver acquired a blackish, and the blade of a pen-knife a copperish colour, from being immersed in the water. It keeps in bottles, and bears carriage.

Evaporated, he got at different trials only from twenty-eight to forty-eight grains of sediment from a gallon ; though Dr. *Lucas* had alledged he got one hundred and thirty-six grains from the same quantity of water.

He concludes with saying, here is plenty of iron, with some sulphur and natron, and probably a little copper, with little or no calcareous nitre or earth.

I think, from the account, the existence of sulphur and copper are both doubtful.

This water for the most part vomits, and frequently purges on the first drinking it, but afterwards it passes off by urine.

M A C C R O O M P,

Situated sixteen miles from CORK,

Is a chalybeate which struck a purple with galls, and lathered smooth with soap.

Evaporated, a gallon yielded only eight grains, which, Dr. *Rutty* says, is an ochre, mixed with natron.

FRENCH WATERS.

ABCOURT NEAR ST. GERMAIN,

Four leagues from PARIS,

Is a brisk chalybeate, which smells somewhat sulphureous, and strikes a purplish red with galls, and a green with syrup of violets. Two pounds of the water, evaporated, left twenty-four grains of sediment, which Monsieur Gouttard^a says, was composed of eight grains of nitrous salt, which effervesced with oil of vitriol, and sixteen grains of ochreous earth.

GERMAN WATERS.

The German waters are most of them more highly impregnated with a mineral spirit and fine volatile acid, than any of those of this country.

^a See *Journal des Sçavans* 1719, page 75. and *Rieger Introduct. in Notiam*, &c.

K U K A OR G U G G A,

This spring is situated in the county of GRADITZ, in the kingdom of BOHEMIA, near to the town of IAROMITZ, at the conflux of the rivers ELBE and ORLITZ.

Dr. *Christ. Mich. Adolphus* gives a very particular account of it in his treatise *de quibusdam fontibus soteriis*, page 151, &c.

This is a very brisk water as taken up from the fountain; it sparkles and throws up a large quantity of air bubbles. It is plentifully impregnated with a fine mineral spirit and subtile volatile acid, which both evaporate soon. It kills fishes thrown into it.

It has a grateful pleasant taste, and both smells and tastes somewhat sulphureous. Its smell is gently pungent, and affects the whole head; and if the water be exposed to heat, it emits a penetrating acid sulphureous smelling vapour.

Galls thrown into the water, as it is just taken up from the fountain, strike a purple colour; but if the water be carried only
but

but a very little way, they give a pale red. Oil of tartar makes it a little white or milky.

This water, after standing, deposited first a quantity of ochreous, tephaceous, and calcareous matter, the proportions of which he does not mention; and afterwards, on being evaporated, yielded in the proportion of one hundred and forty seven grains from a gallon, or of eighteen $\frac{8}{20}$ grains from a pint, of a salt which had all the characteristics of natron or soda; and from its crackling on the red-hot iron it should seem to have a small admixture of sea salt.

The sediment had a mixture of a small portion of a fossil oil common to all waters.

This on the whole seems to be of the same nature as the Spaw waters, but contains a larger proportion of natron than any of them.

He says it does not contain alum or tin, as some have alledged, though upon torturing the precipitate which adhered to the sides of the evaporating pan, he got half a scruple of tin, which he does not think was originally mixed with the water; which

is most likely, as we know of no water in which tin has hitherto been found.

It operates mostly by perspiration, sometimes by spitting, and sometimes by sweat or urine.

L I G N I T Z,

Situated in SILESIA,

This water, mentioned by Dr. *Rieger*, is a light chalybeate, with a penetrating sulphureous smell, and contains some salt of the alkaline kind. The analysis is not particular enough.

B R A B A C H,

In the district of MENGERSKIRCHEN, in the country of NASSAW,

Is a brisk spirity chalybeate water, which may be preserved long in well stoppt bottles, but is soon lost in the open air.

It tastes a little saltish, sulphureous, and astringent.

It drops a fine ochre in its well and channels, and when calcined shells are thrown into it. It gives a red colour with galls, and
tinges

tinges the stools of the drinkers black, as most other chalybeates do; and it turns milky with oleum tartari per deliquium.

Evaporated, it leaves a salt which effervesces with acids, and becomes green with syrup of violets. Hence Dr. *Rieger* concludes, that it contains iron, an alkaline salt, and a calcareous earth; and he observes, that Dr. *Theod. Phil. Schacht*, who gives the history of this water, tells us, that it is a good strengthener, and useful to promote digestion, and in hypocondriacal complaints.

S U L Z B A C H,

Situated three leagues from the town of
COLMAR, in ALSACE.

In the 14th volume of the *Commentaria de rebus gestis in Medicina & Scientia naturalibus*, we have an abstract of Dr. *Christ. Hausman's* account of the Sulzbach acidulæ. He says, they have a vinous taste, and contain a great deal of air, and of a subtile vitriolic acid.

Seven pounds evaporated left sixty-four grains of a white foliated sediment, which was composed of a small portion of vitriol,

* Vol. xiv. part 1. page 147.

mineral alkali, a calcareous, felenitical, and vitrescible earth, with somewhat of a bitumenous or oily matter.

SCOLLIENSES,

Situated in Upper RHOETIA, or the country of the GRISONS, in SWITZERLAND.

The waters called Salsulæ Scollienfes are so full of an elastic matter, that they often burst the bottles in which they are kept.

They have a saltish taste, and at the fountain they turned reddish with galls, but soon lost their chalybeate properties.

Dr. Ratty, who gives an account of them from the *Ephimer. Nat. curios. cent. 9. obs. 24, 25, 26.* observes, that spirit of sal ammoniac produced no change in the water, but that spirit of vitriol caused a noble ebullition.

Scheuzer evaporated this water, and got in the proportion of twelve drachms, two scruples, and eight grains of sediment from a gallon, which, Dr. Ratty says, was probably natron, with a mixture of sea salt.

This

This water makes the drinkers giddy, and operates mildly, though largely by stool, and by spitting.

It is esteemed an excellent preventative, and cure for cholicky pains.

S P A W,

Situated in the bishoprick of LIEGE, seven leagues south east from the town of LIEGE.

There are in and near to this place several springs which afford fine brisk chalybeate waters, which we shall consider the more particularly, as they are the best known and the most drank in Great Britain of any of the foreign mineral waters.

Dr. *Lucas* has given us the most particular, and seemingly the best analysis of these waters, and therefore we shall here give an abstract from his essay; and, at the same time, take notice in what he differs from other authors who have wrote on the same subject.

The most remarkable waters at Spaw are,

1. The *Poboun*, situated in the middle of the village.

2. *Sau-*

2. *Sauveniere*, a mile and a half east from it.

3. *Groisbeck*, near to the *Sauveniere*.

4. *Tonnelet*, situated a little to the left of the road to the *Sauveniere*.

5. *Wartroz*, near to the *Tonnelet*.

6. *Geronstierre*, two miles south of *Spaw*.

7. *Sarts* or *Niveset*, in the district of *Sarts*.

8. *Chevron* or *Bru*, in the principality of *Stavelot*.

9, 10. <i>Couve</i> and <i>Beverse</i> .	} All near Malmedy.
11. <i>Sige</i> .	
12. <i>Geromont</i> .	

P O H O U N.

The *Pohoun* being a flow deep spring, its water is apt to shew itself differently; but it may be looked upon to be in its most perfect and natural state in cold dry weather, when it appears colourless, pellucid, and inodorous; and imprints a sub-acid chalybeate taste with an agreeable smartness on the mouth. At such times when lifted out of the well, it does not appear to sparkle, but covers the glass on the inside with small air

air bubbles after standing some little time; however, if it be agitated, or poured out of one glass into another, it then sparkles.

In wet, or moist, and warm weather, the water of this spring becomes wheyish and turbid, and shews fewer air bubbles; and sometimes a kind of murmuring noise is heard in the well.

It is, as we already observed, in its greatest perfection when taken up in cold dry weather; and though charged with mineral particles, is near as light as distilled water: for Dr. *Lucas* says, that a vessel which weighed six ounces, two drachms and forty-five grains, when filled with distilled water, only weighed one grain more when filled with Pohoun water; but by standing till its volatile mineral spirit evaporated, it increased two grains in its specific gravity.

The heat of the water was to that of the atmosphere, when examined by *Prin's* double tubed pocket thermometer, constructed on *Fahrenheit's* scale, as 52 or 53 to 67, and variations to 84.

This water, when exposed to a very gentle heat, seems to boil and throw up a quantity of air bubbles, as it does when
put

put under the exhausted receiver of an air pump. If these bubbles be viewed in the sun beams, a little mist will be seen for some seconds over the surface of the water, whence a cold air will be perceived to issue, though the water be growing warm.

These waters, as well as most others of the chalybeate class, have been called by the name of Acidulæ, but Dr. *Hoffman* thinks, that they should rather have been called Alkalicæ, because they ferment, or cause an ebullition with acids, and turn syrup of violets green; however, Dr. *Lucas* has proved (if his experiments are faithfully related) that they justly deserve the name of *Acidulæ*.

He put a tea spoonful of syrup of violets to two ounces of the Pohoun water, just as it was taken up from the fountain, and immediately upon mixture it struck a rose purple, which instantly vanishing, left it of a pale blue; in a minute after, it changed to a sea green, first on the surface, and presently all over; till in about fifteen minutes it appeared of a bright green, which gradually deepened to a grass green; and
appeared

appeared so at the end of eight hours, and then bore a sky coloured changeable pellicle. Dr. *Lucas* says, that by this experiment, we learn that the water as drawn from the fountain is impregnated with a fine volatile acid, which soon flies off, and leaves the water in a neutral state, impregnated with iron, and the fossil alkali, when it immediately tinges the water of a green colour.

Dr. *Limbourg*, who published an account of the Spaw waters in 1754, says (in p. 133. §. 135.) that the syrup of violets does not at first give any sign of either acid or alkali, but that after some time the alkali being disengaged from its acid, gives the syrup a green colour.

Dr. *Lucas* dipped a piece of paper, dyed with the tournsol, into the water taken immediately up from the fountain; it changed it first to a crimson, and then to a pale red colour, which is only to be done by acids.

As a further proof of this predominant acid, he threw half an ounce of filings of iron into a quart of water, as it was taken from the fountain, and immediately an extraordinary intestine motion was produced; and

and the water after this tinged more readily, as well as more deeply with the infusion of galls, than it did in its highest perfection at any time at the spring. Upon filtrating the water, and weighing the filings of iron, they were found to have lost about six grains of their weight. By allowing another quart of water, with a like quantity of filings of iron in it, to remain in an open vessel for eight days, it lost its property of tinging with galls and its chalybeate taste; he then filtrated off the water, and found that the filings of iron were mixed with a fine rust of iron, and had gained one grain in weight. The rust or ochre which was mixed with the filings, he says, was that part of the iron which had been dissolved by the volatile acid joined to the natural iron of the water, both of which had precipitated when the volatile acid of the water had evaporated.

Dr. *Limbourg* (ibid. page 89.) says, if a piece of iron be thrown into the Spaw water, that the acids of the water quit the original ferruginous particles that were dissolved in it, and attack the new piece
of

of iron that is put into it, and preserves its quality of tinging with galls for several days, even though exposed to the open air.

All acids, both vegetable and mineral, raise an intestine motion with the Pohoun and other Spaw waters, and the strong vitriolic acid causes a strong fermentation, which has been brought as a proof of their being alkaline; but Dr. *Lucas* observes, that this fermentation is entirely occasioned by the fixed acids dislodging the volatile, with which the waters are impregnated; which, he says, is evidently proved by no ebullition following on the mixture of these acids, after the native volatile acid is evaporated, and the waters are more of an alkaline nature, than they were in their original state.

Upon mixing an alkaline ley with this water, no sensible ebullition was to be observed, but there followed a precipitation of two different sorts of matter, the one a white earth, the other an opaque ochre; and when the water which remained was evaporated, Dr. *Lucas* obtained a particular prismatic chrySTALLIZED salt, which had a bitter nitrous taste and appearance; it hardly stood the

humidity of the air, and parted with a subtile volatile fluid, both by the affusion of the strong vitriolic acid, and by the force of fire, which, the Doctor says, shews the temporary union of a most volatile acid fluid with a fixed alkali ^a.

The recent Pohoun water, as well as all the other Spaw waters, curdles with soap, but mixes smoothly with milk, whether it be cold, or of a boiling heat: and they kill fishes put into them, in less than two minutes.

Ten pints of this water filled a large cucurbit, till within eight or ten inches of the top, which was put on a furnace, and a receiver being fitted to it, and properly luted, a fire was applied gradually. The water sparkled and bubbled with a crackling noise, and had all the appearance

^a This salt obtained by the mixture of a fixed alkali with the Pohoun water, seems to be different from any got by a mixture of alkalies with any of the fixed acids; and if the experiment is fairly related, it shews that there is a greater difference between the fixed vitriolic acid, and what is said to be a volatile vitriolic acid that exists in mineral waters, than is generally imagined. The same alkaline salt mixed with spirit of vitriol would have produced a tartarus vitriolatus.

of boiling, long before the glass was sensibly warmed; the bubbles rose three or four inches above the surface of the water, and as the air and mineral spirit escaped the watery particles fell back again into the general mass. This sparkling, and bubbling, continued till the water came near to a boiling heat, but after this they sensibly decreased. By this time the water was in some measure decomposed; it grew first milky, and by degrees more and more turbid till it became quite muddy, and of a brown colour; but before it came to this, a variegated pellicle arose and covered the whole surface of the water, and at the sides it coated the glass with ochre.

In the distillation it exhibited nothing different from common water; the first ounce that came over shewed signs of being impregnated with a volatile acid, by striking a rose purple with syrup of violets and blue paper, which soon vanished; by curdling somewhat a solution of soap; by causing a slight ebullition with a solution of the volatile alkali; and by turning milky with the solutions of silver and of lead. After

two or three ounces had come over it seemed to differ little from simple water, producing no perceptible effects.

The remaining liquor filtrated, struck a blue, and then a green with the syrup of violets.

Dr. *Limbourg*, in his treatise on the Spaw waters, tells us, that Mr. *Chrôuet*, having distilled these waters in a tin vessel, found a sweet and white saccharum saturni in the capital, from the volatile acid having eroded the tin, or rather the lead which was mixed with it. And that Mr. *De Presseaux* obtained a liquor which gave a purple colour to syrup of violets: but he adds, that he himself having repeatedly distilled this water (see p. 87.) never could obtain any such liquor which gave proofs of an acid; but on the contrary, that the water which came over was limpid, insipid, and disagreeable, and changed the colour of the syrup of violets slowly to a green; he says, perhaps his having made too hasty a fire may have been the occasion of his want of success in searching for an acid.

Ten pints of the water put over the fire in a large open vessel, and let stand till they came to a boiling heat, lost their property of tinging with galls, and dropped all their iron in form of an ochreous earth; they were then passed through a filtre, and the ochre being separated, was found to weigh about ten grains.

Upon evaporating this water which had been deprived of its volatile, and chalybeate principles, it at first appeared to be full of minute flakes, like flowers of benzoin, and then threw up a pellicle, which broke and sunk to the bottom; this pellicle was succeeded by another, and that by a third, &c. till the whole was reduced to dryness. The liquor, as it was reduced to about an eighth or tenth part, appeared of a pale white wine colour. The residuum, when dried, weighed twenty grains, which, when examined, was found to be composed of an alkaline salt, and earth partly calcareous, partly felenitical; and the whole coloured with an oily matter, common to all waters.

From the whole, we see that this water is highly impregnated with a mineral spirit

and air ; and that twenty pints contain such a quantity of a fine acid, as is sufficient not only to keep suspended the principles with which it is impregnated, but likewise further to dissolve sixty grains of the filings of iron, besides what of the subtile acid may have evaporated, during the time of the operation.

The solid contents which, Dr. *Lucas* says, amount to about sixty grains in the twenty pints, are composed of twenty grains of a martial earth ; twenty-two grains of other earths, of which thirteen grains are calcareous, nine grains selenite ; and eighteen of a fossil alkaline salt, which are mixed with a small portion of an oily matter.

Dr. *Limbourg*, besides the principles here mentioned, suspects a mixture of sea salt, and of a small portion of a Glauber salt ; for he says, the salt of this water thrown into spirit of nitre, forms an aqua regia, and the taste of the salt, and form of its chrystals give a suspicion of its containing a portion of a Glauber salt. Most authors have alledged, that all the Spaw waters contain likewise a sulphureous principle from
their

their smell ; but this is certainly no more than what is common almost to all chalybeate waters, and arises from a mixture of that subtile vapour, which always accompanies the solution of iron by the vitriolic acid, and not from a mixture of a true and substantial sulphur.

Dr. *Rutty* (vid. p. 323.) observes, that the quantity of solid contents, obtained by evaporation from the Pohoun water, varies very considerably at different times : he says, that a gallon yielded at one trial thirty-two grains, in a second thirty-seven, in a third forty-eight, and in a fourth eighty.

S A U V E N I E R.

This water has somewhat of a pyrites smell, which is not to be observed at a distance from the fountain.

It appears to be compounded on the same principles, and to contain the same sort of ingredients as the Pohoun water, but in different proportions ; for it dissolves somewhat more of the iron, stands longer fine, and preserves longer its purple tinging quality.

Twenty pints yielded only eighteen grains of a pale brown ochre coloured sediment, which was made up of six grains and a half of ochre, four grains of a calcareous, and two grains and a half of a selenitical earth, five grains of an alkaline salt, and an oily matter.

G R O I S B E C K.

This spring yields a water impregnated in the same manner as the Pohoun, but in different proportions: its taste is vitriolic, with a remarkable sense of sub-acidity and stypticity; and it has somewhat of the pyrites smell at the fountain.

Dr. *Lucas* says, that this water contains more acid, and less earth than the Pohoun; it tinges the juice of the blue bottle and blue paper more upon the red; and the abatement of colour, and change to a green are slower than with the Pohoun; and soap is decomposed more expeditiously, in greater quantity, and more effectually; and it dissolves more iron, though he does not mention the precise quantity.

Twenty

Twenty pints evaporated yielded eighteen grains of sediment, eight grains of ochre or martial earth, seven grains of other earths, four grains calcareous, three grains selenité, and four grains of an alkaline salt; and an oily matter.

T O N N E L E T.

This spring has been much neglected, though Dr. *Lucas* says, it merits the first rank among the Spaw waters, and is one of the most sprightly in the world. It is colourless, bright, and transparent, and it neither does nor can foul its own basin, and no pellicle can rest on its surface, from the quickness of its motion and discharge.

It has no smell, though in warm weather the neighbouring soil sometimes emits a pyritous exhalation. It has a sub-acid, smart, sprightly taste, not unlike the briskest Champagne wine.

It is by much the coldest and the lightest of any of the Spaw waters; its temperature is to that of the atmosphere, as 49 and 50, to 66 and 84; and its weight is a grain less in the pint than the Pohoun,

as it is taken up from the fountain ; and it remains a grain less, after both are deprived of their volatile parts.

It does not sparkle instantly upon being taken up from the fountain, but does so soon after, and even as brightly as the Pohoun ; and it soon covers the whole external surface of the glass with a thick dewy moisture.

If a phial be not immersed in the well, it is impossible to fill it free from air bubbles, and even then, if it be not instantly stopt, it will appear full of them ; and if let stand, after it is thus stopt for some time, an empty space is discovered at the top of the phial, which is occupied by the subtile spirit and elastic air, in the same manner as if the bottle had been filled with hot water ; but the space is not so large.

If a bottle half full of this water be agitated, the air rushes out with a greater explosion than from the Pohoun. And if a well corked bottle, whether it be completely filled or not, be set in a warm place, it will either throw out the cork, or burst the bottle with a louder explosion than the Pohoun ;
and

and if the cork fly, and the bottle be full, it will run over like Champaigne wine; or if the bottle has been laid on its side, the water will be thrown, with the cork, to several feet distance: and if set on the fire, it is more quickly and more sensibly affected with the heat, and throws the air bubbles some inches higher, than any of the other waters; and when thus decomposed, it is not so high coloured as the Pohoun water.

This water, taken up from the spring, shews first a pale crimson with syrup of violets, which instantly changes to a bright rose purple, and then to a violet colour. In about two minutes it becomes of a sky blue, and then changes to a sea green at the surface, and by degrees it changes all over to a beautiful bright green. If when the green has extended to about half an inch below the surface it be mixed, that colour will predominate; but if left unmoved after the water is first poured on the syrup, it will appear half green, half blue the next day.

It stands longer in the open air without any visible change than the Pohoun, because

cause it is less loaded with an earthy matter, though it loses more of its spirit, and abates more of its purple tinging quality with galls in the same space of time; and yet the Doctor tells us (see vol. ii. p. 202. §. 274. 2.) that this water, exposed to the open air of the same temperature with the rest, i. e. as 52 or 53, to 67, and variations to 84, and for the same time, or even spoiled of all its elastic air and spirit by agitation, or the air pump, still shews some strong appearances of purple with the syrup of violets.

It dissolved two grains more of the filings of iron than the Pohoun, and retained after this its purple tinging quality with galls at the end of nine days, which the other waters had lost by the fifth.

From these experiments it appears, that this water is more strongly charged than of any of the others with the subtile volatile spirit, on which the *energy* of all waters of this class depends.

Yet however evident an acid appears in this water, such is the nature of that most volatile fluid, that it mixes as smoothly
and

and easily with milk, whether it be cold or hot, as common water.

The appearances and products of these waters in distillation, correspond nearly with those of the Pohoun, excepting that they were sooner affected by heat, and the ebullition was stronger; and the liquor remaining after distillation still gave some faint marks of a chalybeate water, and did not seem to be so entirely deprived of its acid solvent as the other Spaw waters: and its alkaline salt was not so pure as that of the Geronsterre.

The solid contents obtained from twenty pints by evaporation were,

Of ochre or iron ten grains; of earth five grains (three calcareous, and two felenite) of an alkaline salt five grains; all mixed with an oily matter.

W A R T R O Z.

This spring is in the lowest situation of any of those about Spaw, and is more apt to be foul; but when the well is cleared out, and the water pure, it is found to be of the same nature as that of the Pohoun
and

and other Spaw waters, and to be impregnated with the same principles, though in different proportions. He says, they err who deem it purgative.

This water dissolves the same quantity of filings of iron as the Pohoun.

Twenty pints yielded of solid contents by evaporation,

Of iron or ochre eight grains; earth six grains (three and a half calcareous, and two and a half felenite) alkaline salt six grains, all mixed with an oily matter, common to all waters.

GERONSTERRE.

The water of this spring is quite bright and colourless, has the same brisk, vinous, sub-acid, chalybeate taste as the other Spaw waters, and a sulphureous smell at the fountain, which it loses by being carried to a distance: this sulphureous smell is strongest in moist warm weather, or previous thereto.

The sulphureous vapour of this water affects the head of some people who drink it, and occasions a giddiness or kind of drunkenness, which lasts for ten or fifteen minutes,
and

and sometimes for half an hour on first drinking it ; but this effect is not peculiar to the Geronsterre water alone, for the Pyrmont and several other of the brisk chalybeates have been observed to have the same effects.

The Geronsterre water has been alledged to be remarkable for bearing carriage the least of any of the Spaw waters, because of its being more apt to burst the bottles ; the least heat, a storm, or clap of thunder raising it to a great degree of fermentation, for which reasons it has been thought not fit for transportation ; but Dr. *Lucas* seems to look upon this as a vulgar prejudice, artfully propagated to make people believe that this water cannot be drank any where but at Spaw, and even at the fountain ; and he affirms, that it bears carriage to the village, as well as any of the other waters ; nay, that it may be as easily transported into Great Britain, and be brought in as great perfection to London, as any of the other Spaw waters ; from which he seems to think it differs but little, except in its smell.

It does not sparkle unless when poured from one vessel to another. Upon standing
in

in an open vessel for a few minutes, it covers the inside of the glass with small bright air bubbles; and in proportion as they escape, it throws up a mother of pearl coloured pellicle, and only contracts a flight milky hue, when the Pohoun and Groisbeck let drop an earthy sediment, and the other Spaw waters appear turbid.

The temperature of the spring was to that of the atmosphere, as 51, 52 to 67, 84; hence it appears to be colder than any of the other springs, except the Tonnelet.

It weighs half a grain less in the pint than the Pohoun water, and only one-fourth after it has lost its volatile parts. It dissolves nearly the same quantity of filings of iron as the Pohoun.

After three hours it became more milky; with a solution of corrosive sublimate than the other waters; which Dr. *Lucas* says, indicates more of a pure alkaline salt, if not something of an inflammable or oily matter, subtilised by putrefaction: however, I do not think that we have any reason to believe with Dr. *Lucas*, that the smell of this water depends on putrefaction.

In

In the distilling, the sparkling did not rise so high ; the ebullition was less considerable, bubbles smaller, and the noise less, and it did not appear quite so turbid. The distilled liquor gave no sensible proof of any thing sulphureous, or of containing more phlogiston than the other waters ; and hence he concludes, that it contains but little of that matter. If this account of Dr. *Lucas's* be true, one should imagine, that instead of being a more spiritry and lively water, apt to burst its bottles, that it was neither so brisk, nor so apt to fly as the waters of the other springs.

Dr. *Lucas* says, its alkaline salt is purer, and less coloured than the salt of the other waters ; and in other respects it agrees with them ; and he thinks that its virtues depend entirely on the same principles ; and therefore, that we ought not to lay stress upon the slight sulphureous smell of the waters, and from thence to believe that they were possessed of extraordinary virtues,

Evaporated, twenty pints yielded of iron or ochre ten grains, of earth fourteen, nine calcareous, five selenite ; of alkaline salt

fix grains, and an oily matter common to all waters.

SARTS OR NIVÉSE T.

In the district of Sarts is a water which approaches to the nature of the Tonnelet, but it is rather less vinous, smart, and brisk, though more acid, austere, and stiptick; for the acid seems to be more redundant, as well as of a more gross and fixed nature. It weighed half a grain less than the Pohoun, both recent, and deprived of its volatile parts.

Twenty pints evaporated yielded of solid contents thirty-two grains, of iron or ochre thirteen grains, of earth sixteen, eight calcareous, eight selenite; of alkaline salt three grains, and an oily matter.

CHREVRON OR BRU,

In the principality of STAVELET, above two leagues from SPAW,

Is another fountain approaching to the nature of the Tonnelet, which the physicians at Liege have artfully decried, because

cause it is not in the principality of Liege, though it is of the same nature as the Spaw waters, and not inferior to any of them; and by every trial shewed that it is impregnated with the same principles, only different in the proportions.

Twenty pints evaporated yielded of iron thirteen grains; of earth twenty, ten calcareous, and ten selenite; of alkaline salt two grains, and an oily matter.

COUVE AND BEVERSE,

Both near MALMEDY, about three leagues distant from SPAW.

1. The *Couve* agrees nearly with the Tonnelet, in the proportions and qualities of the products it yielded by distillation and evaporation; it may be placed in a medium, betwixt the Tonnelet and Wartroz: it hardly equals the pellucidity, smartness, and generous vinous taste of the first, but greatly out-does the latter.

Twenty pints yielded by evaporation twenty grains of solid contents. The particulars the Doctor does not mention.

2. The *Beverse* agrees with the last, but is not quite so smart upon keeping: twenty pints yielded by evaporation twenty-four grains of solid contents.

L A S I G E.

This and the Geromont, which we are next to consider, are both situated near Malmedy. Although they have some of the general properties of the other Spaw waters, yet they differ from them in many other respects.

The water of La Sige is moderately sub-acid, smart, and grateful, but has no sensible chalybeate taste. It sparkles like Champaign wine when poured from one glass to another; and upon standing, loses its mineral spirit, throws up a thick mother of pearl coloured pellicle.

Its temperature is nearly the same as the Pohoun, and it is rather heavier when deprived of its volatile parts.

With syrup of violets it only at first struck a blue, which in less than a minute changed to a pale, and to a thorough green. It decomposed soap when recent, but after
it

it had lost its volatile parts, it lost in a great measure this quality, and only slightly coagulated it.

It dissolved but twenty grains (or one third part) of the filings of iron, which the Pohoun did.

It is a weak chalybeate, but greatly loaded with earthy and saline matter; and it is difficult to ascertain the quantity of iron it contains; for it does not drop it single, but mixed with earthy and saline particles; and hence, as it is mixed with them, it is not easy to ascertain the exact proportion; but from the strongest tinge it strikes with an infusion of galls, it does not seem to contain more than about an eighth part of what the Fonnelet does.

The alkaline salt, in this water, does not seem to be intirely pure, for it tasted muriatic, and gave fumes like those of sea salt, when oil of vitriol was dropt upon it.

Twenty pints evaporated yielded of iron or ochre one grain and a quarter, or nearly so; of earth one hundred and thirty-eight grains, of which one hundred and eight were calcareous, thirty selenite; of

alkaline salt twenty grains, which seemed to have a mixture of sea salt, and an oily matter common to all waters.

Hence we see that this water is much more loaded with earth, than the others we have already taken notice of; and it does not seem to contain so much of a predominant acid as they do.

GEROMONT,

Is a spring situated near to La Sige, and which is impregnated nearly in the same manner, but in different proportions. The martial principles seem to be nearly in the same quantity as in the other, the earthy less; but the saline in much greater proportion than in it, or in any of the other Spaw waters; and it has a mixture of sea salt.

It strikes at first only a bright blue with the syrup of violets, and dissolves but one third part (or twenty grains) of filings of iron of what the Pohoun does.

Twenty pints evaporated yielded of iron one grain and a quarter, of earth a little above ninety grains, of which seventy-four were calcareous, sixteen selenitical; of
lamel-

lamellated salt sixty-eight grains, which, when exposed to the air, increased thirty-two grains in weight, and partly run per deliquium. The salt was a native alkali, with a mixture of sea salt.

OF SPAW WATERS IN GENERAL.

From what has been said of these celebrated waters of Spaw, it is evident, that they are all compounded of the same principles, and of the same materials, though in different proportions, and that all of them abound with a fine mineral spirit and elastic air; and contain more or less iron, a calcareous and selenitical earth, a fossil alkaline, and perhaps some portion of a marine salt, and an oily matter common to all waters; which are all kept suspended, dissolved, and in a neutral state, by means of a fine volatile vitriolic acid.

From a review of their contents, we cannot imagine that their virtues principally depend on the small quantity of solid matters they contain, but must believe that these depend mostly on their subtile mineral spirit and volatile vitriolic acid, diffused

through such a quantity of pure element, which is rendered more active and penetrating, both in the stomach and bowels, and when taken up into circulation and carried through the minutest vessels and glands of the body, by means of that small portion of iron, earth, salt, and oily matter with which they are impregnated.

A course of these waters has been found useful in cases of an universal languor and weakness, which proceed from too great a relaxation of the stomach, and of the fibres in general, and where the constitution has been weakened by diseases, or by too sedentary a way of life; in weak relaxed gross habits; in the end of the gout and rheumatism, where the constitution needs to be repaired; in such asthmatic disorders and chronic coughs as proceed from too great relaxation of the pulmonary vessels; in cases where the blood is too thin and putrescent, occasioned by irregularities, or by scorbutic or other putrid disorders; in hysterical and hypocondriacal complaints, where the fibres are too irritable and relaxed, and where the habit in general
needs

needs to be restored; in paralytic disorders; in gleans; in the fluor albus, and in other inordinate discharges, which proceed from weakness, or too great a relaxation of any particular part; in female obstructions, and in most other cases where a strengthening and brisk stimulating resolving chalybeate remedy is wanted, and where there are no confirmed obstructions, or so much heat and fever as to contra-indicate their use.

But however useful they may be in such cases, yet they are not so in all; for they commonly disagree, and often do hurt where there is much heat and fever; in hectic fevers, in ulcerations of the lungs, and of other internal parts, particularly where there is no free outlet to the matter, and in most confirmed obstructions attended with fever.

And they often do hurt in hot, bilious, and plethoric constitutions, when used before the body is cooled by proper evacuations.

As the Spaw waters are impregnated with different proportions of the same materials, they may be chosen differently according to the intentions we have in view. The

Poboun

Pohoun is the most charged with the iron, and at the same time contains an alkaline salt and superabundant acid, and abounds with a fine mineral spirit. The *Tonnelet* and *Geronsterre* are weaker chalybeates, but are brisker and rather more spirituous. The *Groesbeck*, *Sauveniere*, and *Wartroz*, are still weaker chalybeates. The *Sige* is an extremely weak chalybeate, but highly impregnated with a calcareous and selenitical earth, and contains a greater proportion of a mineral alkaline salt. And the *Geromont* is likewise a weak chalybeate, and contains a great deal of calcareous and selenitical earth, and above three times as much alkaline salt as any of the others.

The season for drinking the Spaw waters is in July and August.

The emptying the first passages is a necessary preparation to their use, as is bleeding in plethoric habits, and where there is much heat.

And in many disorders, Dr. *Lucas* says, warm bathing is amongst the best preparatives, especially with people of a rigid fibre; for it softens and relaxes the fibres, and re-
moves

moves obstructions from the glandular and cutaneous vessels; and hence a course of bathing at Aix-la-Chapelle, or at Chaude Fontaine, is often premised to a course of the Spaw waters, and in some cases of obstinate obstructions, warm bathing is interposed at proper intervals during the course; however, the constitution of the patient and the nature of the disorder can only determine when this is proper. In other cases where the fibres are too lax, the cold bath may be used to assist the operation of the waters, and to forward the cure.

The quantity to be drunk must be different according to the age, the constitution, and the other circumstances of the patient. They are taken from a gill to three or four pints in the day, at repeated draughts; and they are commonly continued from three or four weeks to six or eight, or even to two or three months or more.

When they lye cold on the stomach, a few carvy seeds, or cardamoms, or other aromatic may be taken with them. And in some particular cases, a little warm water may be mixed just before drinking.

When

When a patient is costive, a little Rochelle or other salts, or some grains of rhubarb may be mixed occasionally with the first glasses of the water in the morning.

Where there is too much heat, the saline draughts, sal polychrest, nitre, or vegetable acids may be given, and a cool regimen pursued while the patient drinks the waters. I have known ten, fifteen, twenty, or thirty drops of elixir of vitriol, taken two or three times a day in a glass of Spaw waters, remove remitting and intermitting feverish complaints, which had resisted the force of other remedies. And Dr. *Lucas* says, that sometimes in ulcers of the kidneys, and of the other internal organs, when there has been a free outlet to the matter, that a course of these waters has been found extremely useful in strengthening and healing the ulcerated parts.

I T A L I A N W A T E R S.

B R A N D O L A.

In the year 1763 Dr. *Dominicus Vandellius* published an account of this waters, which is situated half a mile from the castle of Brandola, from which it got its name, and twenty-three from Modena.

Its spring rises in a hollow at the bottom of a mountain, and is covered with a house to preserve it pure.

The water runs first into one small bason, and passes from thence into another, and is conveyed from thence by a brass pipe into a stone bason, where it is drank and put up in bottles for exportation.

It leaves no sediment or tincture in its pipe, nor in its bason or channels.

It is extremely limpid and chrySTALLINE, but becomes a little turbid by being exposed for some time to the sun in an open vessel.

* See D'ell Acque de Brandola, dissertatione di Dominico Vandelli, in Modena 1763. This water scarcely deserves the name of a chalybeate, and therefore perhaps ought to have been inserted more properly in Chap. ii. of Class 1st.

It has a very flight smell of sulphur, and a subacid taste. If a flask be filled one half full with it, and be shaken, while a finger is held on the mouth of the flask, it froths and sparkles; and on removing the finger it emits a vapour with force, which carries some of the water along with it to the distance of four feet; from which it is evident, that it is plentifully impregnated with a *mineral spirit*, about the nature of which authors differ, and are divided whether it be only an elastic air, or be air united to a fine volatile acid which renders it more active; he thinks the water now treated of certainly contains an acid.

A piece of bright silver coin, left in the well, suffered no change of colour.

A solution of mercury in spirit of nitre, and a solution of saccharum saturni dropt successively into different parcels of this water, occasioned a white cloud, as did oleum tartari per deliquium, and spirit of sal ammoniac.

Syrup of violets became of a beautiful green, and the solution of tournsol of a red-ish colour, when mixed with the water.

Neither

Neither the strong nor weak acids, or the solution of silver, or of Cyprus vitriol, or balaustine flowers, or galls, produced any change.

Fifty pounds of the water were distilled with a very slow fire, and the operation lasted eight days; when the distillation began, both blue and red paper was put into the neck of the retort, but the vapour produced no change of colour in either, that could in the least indicate the nature of the mineral spirit.

After some time the water became cloudy, and yellow flocculi were observed floating in it, and at last precipitated to the bottom, and formed a yellow sediment as the evaporation drew nigh to a conclusion.

When the operation was finished, this sediment weighed two drachms and two scruples; it was of a dirty yellowish colour, of the consistence of pulp of cassia, had a bitterish ammoniacal taste, and attracted moisture when exposed to the air. It was lixiviated with sixteen ounces of distilled water, and the insoluble matter separated by throwing it into a filtre; and this insoluble

soluble matter was again put into sixteen ounces more of distilled water, set upon a sand heat for some time, and again separated by filtration, and then weighed it one scruple.

The two waters which had passed through the filtre, on being evaporated, yielded five Italian scruples and twenty grains of a yellowish coloured alkaline salt that moistened in the air, and twenty grains of Glauber salt. These salts have a mixture of an oily matter, for by being dissolved in water they give it a yellow colour; and after the water has stood some time, there comes somewhat of an unctuous pellicle to the surface.

The alkaline salt ferments with acids, melts and swells like alum when put on a red-hot iron, and loses its yellow colour, which shews that it owed its colour to a mixture of an oily matter.

The Italian scruple (or twenty-four grains) of insoluble matter, consisted of sixteen grains of selenite, and eight grains of an earth which fermented a little with acids, and seemed to be of the species called Margacea.

These

These two earths were again mixed, and then well dried and rubbed, and a loadstone applied, which attracted some particles, and shewed that this water contains a small portion of iron, though so very small, and so enveloped in the other principles, as not to be distinguished in the water by the mixture of galls, or by any of the other common experiments.

This water is commonly drank from two to ten pounds in the day; it promotes the secretions by the kidneys and skin; and it generally keeps the belly open.

Besides the chalybeate waters containing natron or a native alkaline salt, already mentioned, there are many others of this sort taken notice of by authors, such as,

The *Berstad* and *Schwalheim*, in the district of Weteraw, in the country of Hesse.

The waters called *Veteragnenses*, in Silesia.

The *Leibenstein* water in Franconia (in Ducatu Meinungenfi).

The *Dennemarksbrunnen* in Sweden, and many others.

S E C T. IV.

OF CHALYBEATE WATERS
CONTAINING SEA SALT.

THERE are very few chalybeate waters which are entirely free from sea salt; but we shall only at present consider, some of those in which it has been found to be the most prevailing salt.

In general the sea salt is in such small quantity, as not to give any taste to the water, or to produce any sensible effects; though in some few, it is in such large quantity, as to give a salt taste, and even to act as a purgative medicine.

Those we shall consider at present are,

ENGLISH.

COBHAM.
TUNBRIDGE.
BUXTON.
MILLAR'S SPAW.
LATHAM.
TIBSHELF.
WITHAM.

CHIPPENHAM.
LANCASTER.
WHITE ACRE.
WEST ASHTON.
CAWTHORP.
DERBY.
WETHERSLACK.
FILAH.
STANGER.

SCOTCH.

SCOTCH.

DUNSE.

IRISH.

CASTLECONNEL.

TRALEE.

GRANSHAW.

NEWTON STEWART.

GALWAY.

FRENCH.

FORGES.

CAEN.

C O B H A M,

In the county of SURREY,

Is a light water, rather a stronger chalybeate than the Tunbridge, but yields less of a solid matter by evaporation; a gallon only affording seven grains, which is mostly ochre, with a small pittance of sea salt.

T U N B R I D G E,

In the county of KENT,

Is at present one of the most famed chalybeate waters in England, and the most resorted to of any, though it does not seem to be preferable to many hundreds in this kingdom.

It is a brisk light water, impregnated with iron, by means of a volatile vitriolic acid; it tastes ferruginous; mixed with

syrup of violets, it at first produces little alteration of colour, but soon begins to change to a green: Dr. *Lucas* says, it does not dissolve any of the filings of iron; but when fresh, causes an ebullition with acids.

It decomposes a little the solution of soap, but mixes smoothly with milk. Exposed to the open air, it soon loses its chalybeate qualities, as it does in a few days, after it is put into bottles.

Dr. *Rutty* says, that evaporated, a gallon yielded at one time nine grains of solid contents, and at another only six; and Dr. *Lister*, that he got only five grains.

Dr. *Lucas*, who since examined this water, alleges that he had seventy-five grains from twenty pints, or thirty of solid matter from a gallon, whereof six grains were ochre, twelve grains earth, partly calcareous, partly selenitical, and twelve grains of sea salt; all which were mixed with an oily matter, common to all waters. Whence this difference?

It is common at Tunbridge, for those who drink the waters, to mix from time to time either a spoonful of common salt, or a little
of

of some other purging salt with the first glass of the waters in the morning, in order to make them operate by stool. They are used in the same manner, and for the same purposes as the *Spaw waters*, though they are certainly neither so brisk nor so efficacious as them.

B U X T O N,

In the county of DERBY,

There is, besides the hot waters, a chalybeate, which has a rough irony taste. Evaporated, a gallon yielded a scruple of a residuum; above one half of which was earth and ochre, the rest a saline matter, composed of sea salt and a calcareous Glauber; according to Dr. *Short* (vol. i. page 229).

M I L L A R ' s S P A W,

STOCKPORT in the county of LANCASTER,

Is a pretty strong steel water, which it is difficult to come at, because it lies on a dangerous precipice.

By evaporation, Dr. *Short* (vol. ii. p. 130.) got twenty-four grains of solid contents from a gallon, twelve grains ochre, and twelve grains of a salt composed of sea salt and a calcareous Glauber.

L A T H A M, in LANCASHIRE,

Is a fine pure chrystalline chalybeate, which Dr. *Short* says, yields by evaporation twenty-six grains from a gallon, thirteen grains earth or sand with ochre, thirteen grains sea salt.

T I B S H E L F, in DERBYSHIRE,

Is a fine clear chalybeate water, which grows white, and throws up a quantity of air bubbles before rain. It sparkles when poured from one glass to another. With syrup of violets it at first is of a blackish blue, which changes to a green. Acids make no change on it: galls strike a purple, and oil of tartar gives a white cloud. Exposed to the air, it loses its property of tinging with galls, at the end of thirty-six hours.

Evaporated,

Evaporated, Dr. *Short* (vol. i. p. 226.) got in the proportion of fifty-three grains from a gallon, of which above twenty-one grains were an orange coloured earth, which fermented strongly with acids. Near thirty-two grains were a saline matter, made up of about twenty-four grains of sea salt, and eight grains of a calcareous Glauber.

C H I P P E N H A M, in W I L T S H I R E,

Is a pretty strong chalybeate which, Dr. *Rutty* says, has a brisk ferruginous taste at the fountain, and turns of a claret colour with galls.

Evaporated, a gallon left thirty-nine grains of residuum, composed of ochre and marine salt, and Dr. *Rutty* says, probably a portion of natron.

W I T H A M, in the county of E S S E X,

Is a chalybeate not entirely void of spirit. It struck a deep purple with galls.

Evaporated, a gallon yielded thirty grains of solid matter, which moistened in the air, and gave a blue flame when laid on the

red-hot iron. *Taverner*, who gives an account of this water, says, the earth fermented with oil of vitriol, and the salt was composed of sea salt and a calcareous Glauber.

LANCASTER, OR SALES SPAW,
In LANCASHIRE,

Is a clear chalybeate, which curdles soap, but not milk. It is a powerful diuretic, said to purge, and to vomit some, when drank to four or five quarts.

Evaporated, *Dr. Short* (vol. ii. p. 130.) got forty grains of sediment from a gallon; twenty-four grains of which were ochre, fifteen sea salt.

WHITE ACRE,
Near TRALES in LANCASHIRE,

Is a very clear brisk chalybeate, covered with a variegated scum, which leaves much ochre in its course. It curdles soap, but not milk. It rather binds than opens the belly.

Evaporated, *Dr. Short* obtained sixty-seven grains of sediment from a gallon;
forty-

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forty-one grains ochre, twenty-six grains of a saline matter, composed of sea salt, and a calcareous Glauber.

W E S T A S H T O N,

In the parish of STEEPLE-ASHTON, in
WILTSHIRE,

Is a weak chalybeate water, but contains a large proportion of a saline matter.

Evaporated, Dr. *Rutty* tells us, that a gallon yielded one hundred and sixty grains, or two drachms, two scruples of sediment, of which sixteen grains were an indissoluble earth, and about two drachms, twenty-four grains a saline matter composed of sea salt, and a calcareous Glauber.

This water curdles milk when boiled with it; three pints and four ounces proved both purgative and diuretic.

C A W T H O R P,

Situated four miles from BOURNE, in
LINCOLNSHIRE,

Is a saltish chalybeate water, which
foams much as it rises from its spring; and

it curdles both soap and milk. It strikes an opaque purple with galls, and a white cloud with oleum tartari per deliquium, and it makes an ebullition with acids.

Evaporated, Dr. *Short* (vol. i. p. 225.) says, a gallon yielded eight scruples, or one hundred and sixty grains of a very white sediment, seventy-two grains of which were sea salt, with a small admixture of a calcareous Glauber; eighty-eight grains an earth of the calcareous kind, mixed with ochre; it fermented, hissed, and smoked with spirit of vitriol, and yet the loadstone acted briskly on it after calcination.

Dr. *Short* ranks this among the purging chalybeate waters.

D E R B Y,

Near to the town of DERBY, in
DERBYSHIRE,

Is a water which is mentioned cursorily by Dr. *Short* (vol. ii. page 48.) as a common chalybeate, which scarce deserves the name of purgative; and yet if his analysis
(*ibid.*

(ibid. p. 131.) be just, it deserves to be more accurately examined and attended to, and seems to be a very strong chalybeate : for he says, that a gallon evaporated, yielded four drachms, twenty four grains of solid contents, of which one hundred and thirty-four grains were ochre, one hundred and thirty sea salt.

WEATHERSLACK,

IN WESTMORLAND,

Is a weak chalybeate, but contains a large portion of sea salt. At the fountain it is clear, and has a salt brackish taste.

It strikes a purplish colour with galls, and gives a white cloud with lixivium of tartar, and with a solution of silver. In summer it smells of sulphur, but not in winter.

It is a purging water, and operates by stool taken the length of two or three pints.

Dr. *Short* evaporated this water (see vol. ii. page 182.) and got one ounce, one drachm, two scruples, and nine grains, or five hundred and ninety grains of solid matter from a gallon, of which thirty grains were a light calcareous earth with ochre, and five hundred

dred and fixty grains sea salt. Dr. *Rutty*, who examined the residuum sent to Dublin, says, the sea salt is combined with some species of the calcareous Glauber salt; that the residuum of the waters contains a little iron; and that in some seasons he suspects likewise a little sulphur.

F I L A H,

Situated in YORKSHIRE, six miles from
SCARBOROUGH,

Has a very salt, chalybeate taste, smells inky, and is covered all the summer with a red scum.

Dr. *Short* (vol. i. page 298.) says, it is a whitish water, and very full of a mineral spirit.

It strikes a red with galls; exhibits a white cloud with alkalies; ferments with acids, and turns syrup of violets green.

The common people drink a gallon of it in a morning, and it proves a powerful purgative and diuretic.

Evaporated, a gallon yielded two ounces or nine hundred and fixty grains, of which
a drachm

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a drachm and five grains were earth, the rest a salt which, on chrySTALLIZATION, proved wholly to be sea salt. Dr. *Rutty* suspects it to have a mixture of a calcareous Glauber salt, from the water giving a white cloud with alkalies, from half a drachm of the salt curdling milk, and from its requiring eight times its own weight of distilled water to dissolve it.

D O R S T H I L L,

In STAFFORDSHIRE, six miles from
LITCHFIELD,

Is a brisk chalybeate, which yields six drachms, one scruple, four grains of sediment from a gallon, composed of sea salt, a calcareous earth, and a bittern.

S T A N G E R,

Situated two miles south of COCKERMOUTH
in CUMBERLAND,

Is a clear brinish vitriolic water, which has an irony taste and smell, and instantly curdles both soap and milk.

When

When drank to four or five pints, it purges with violence upwards and downwards.

Dr. *Short* evaporated this water, and got (vol. ii. page 132.) two ounces, three drachms, one scruple, and ten grains, or one thousand one hundred and seventy grains of sediment from a gallon; of which two ounces, two drachms, or one thousand and eighty grains were sea salt; twenty-eight grains a light calcareous earth.

Dr. *Rutty*, who had some of the gross sediment sent him to Dublin, says, that upon the whole the marine is the predominating salt, that it seems to have a mixture of a calcareous Glauber, and to contain a considerable quantity of iron.

S C O T C H W A T E R S.

D U N S E.

By Dr. *Home's* account of this water, it seems to be a common chalybeate, nearly of the same strength as the Tunbridge. It is clear as rock water, and sparkles a little when taken up in a glass; it killed small fishes

fishes put into it: its smell is like that of other chalybeates, and its taste ferruginous.

When the heat of the atmosphere raised the thermometer to seventy-two, the water raised it fifty-nine, and neighbouring springs only to fifty-four. It mixed smoothly with milk, and dissolved soap. It struck a purple with galls near of the same colour as distilled water, which had two fifths of a grain of sal martis dissolved in a pint of it; and it became milky with a solution of silver in spirit of nitre.

Exposed to the open air, it lost its tinging quality with galls, after two hours.

Evaporated, it yielded in the proportion of twelve grains of sediment from a gallon, which, the Doctor says, had about one sixth part of salt, composed of sea salt and a bittern, the rest ochre and a marly earth.

IRISH WATERS.

CASTLECONNEL,

In the county of LIMERIC,

Is a chalybeate of considerable repute in that country. It has a ferruginous and astringent

tringent taste, and is as light as the German Spaw water. It mixes smoothly with milk, but curdles soap. It exhibits a white cloud with alkalies, and strikes a dark claret colour with galls.

Evaporated, Mr. *S. O'Holloran* of Limeric got twenty-four grains of sediment from a gallon, Dr. *Rutty* only fifteen, which was made up of ochre, an absorbent earth, and sea salt. Dr. *Martin* says, he had fifty-three grains from a gallon.

This water operates principally by urine.

It gave spirit of sal ammoniac a white blueish colour, and gave partly a copperish colour to the blade of a knife, which made Mr. *O'Holloran* suspect a mixture of copper.

T R A L E E,

In the county of KERRY,

Is a spirity chalybeate water, which has a rough ferruginous taste, common to such waters; and by keeping it acquires a sulphureous smell. It struck a deep purple with galls, and a green with syrup of violets at the fountain. It mixed smoothly with milk, and lathered with soap; and exhibited
a white

a white cloud with alkalies, and with a solution of silver.

Evaporated, Dr. *Rutty* got nineteen grains of sediment in one experiment, and twenty grains in another, which were of a dark brown colour, and brackish taste; one half was a marine salt, the other an earth partly calcareous, and mixed with an oily matter, common to all waters.

It lost its chalybeate qualities by keeping, but recovered them by putrefaction.

G R A N S H A W,

Three miles from DUNNAGHADEE, in the
county of DOWNE,

Is a spirity chalybeate that bears keeping. At the fountain it strikes a deep purple with galls, almost like ink; with spirit of sal ammoniac it gave a white, and partly ochreous sediment.

Evaporated, Dr. *Rutty* got twenty-four grains of sediment from a gallon, which fermented with oil of vitriol, and contained ochre and sea salt; it is probable from its thus fermenting that it contains likewise either an earth or natron.

NEWTOWN STEWART,

Situated near CASTLEHILL, in the county
of TYRONE,

Is a chalybeate water which may be kept, and transported in bottles. It struck a deep purple with galls, and gave a white cloud with alkalies, and with a solution of silver.

Evaporated, Dr. *Rutty* says, in one trial a gallon yielded twenty-four grains of residuum; in another only sixteen: in exhaling, it threw up a blueish scum. The sediment had partly a whitish, and partly a brownish colour. It effervesced with acids, and it had a brackish bitterish taste; one fourth of it was sea salt, with a small portion of a calcareous Glauber; the rest an absorbent earth with ochre.

G A L W A Y,

Near to the town of GALWAY, the capital
of the county of the same name.

At the fountain it has a ferruginous smell and taste, and presently strikes a deep purple
with

with galls. It loses its chalybeate virtues by being kept.

It curdles soap, but not milk. Evaporated, a gallon yielded one hundred and twenty-eight grains of sediment; of which, Dr. *Rutty* says, thirty-three grains, on trial, proved to be a calcareous earth, mixed with selenite; ninety-five grains a salt composed of sea salt, and some calcareous Glauber.

And he seems to think there was some natron too, but as no effervescence ensued on mixing oil of vitriol with the saline matter, this seems doubtful.

This water is commonly used as an alterative; but if it be drank in large quantity, it proves purgative.

FRENCH WATERS.

F O R G E S,

In the province of NORMANDY,

Is a common chalybeate which has been long in great repute; there are several springs here, but *Du Clos* (class vii. p. 79.) says, they differ but little from one another.

Evaporated, they left but a small portion of sediment, composed of ochre and marine salt.

In the Memoirs of the Academy of Sciences for 1735, there is an account of an analysis of this water, in which it is said that there is a small portion of an absorbent earth and felenite, with the ochre, and a very small portion of Glauber salt, mixed with the sea salt.

C A E N, in NORMANDY,

Is a brisk chalybeate which, Monsieur *Morlet* says, contains a small quantity of vitriolum martis, an absorbent earth, and a small portion of sea salt, and of a Glauber salt; see *Recueil periodique*, tom. vi. for 1757, page 257.

L A N I O N,

Three leagues from TREGUIR, in LITTLE BRITANY,

Is a chalybeate which has an irony taste, and strikes a black with galls. Dr. *Rieger* says, that when evaporated it left a very small quantity of earth, mixed with a little common salt.

S E C T. V.

OF CHALYBEATE WATERS CONTAINING A CALCAREOUS GLAUBER SALT.

SUCH waters are known by the general marks of chalybeates, joined to those of waters impregnated with a calcareous Glauber salt.

In some of these waters the chalybeate principle is strong; in others weak. In some, the acid which keeps the iron suspended, is in a fixed state, and they retain their chalybeate properties long. In others the acid is volatile, and presently evaporates, when they let drop their iron, and lose entirely their chalybeate properties.

The waters of this class, where the calcareous Glauber salt is in small quantity, act as diuretics, if drank moderately; but if such waters be drank the length of several pints, or if the calcareous Glauber salt be in large proportion, they operate by stool, and have from thence been called purging chalybeate waters.

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Waters of this kind, as they give a brisk stimulus, and help to increase and to brace the tone of the fibres of the stomach and bowels, at the same time that they operate by stool, do not weaken the body so much as other purging medicines commonly do, but on the contrary, their continued use often raises the spirits, and increases the appetite without any sensible decrease of strength.

Those we shall consider at present are,

ENGLISH.

KNOWSLEY.
BURLINGTON.
ASTROPE.
COVENTRY.
BOURNLEY.
TOWNLEY OR HAN-
BRIDGE.
NEWHAM REGIS.
BINLEY.
KINGSCLIFF.
THURSK.
HARTLE POOL.
THOROTON.
ORSTON.
STENFIELD.
KIRBY.
TARLETON.
MALTON.
ASWARBY.

SCARBOROUGH.

CHELTENHAM.

STOKE OR JESSOP.

IRISH.

ATHLONE.

MOUNT PALLAS.

KILINSHAN VALLEY.

GERMAN.

CLEVES.

DRIBURG.

SWALBACH.

PRYMONT.

EGRA.

FRENCH.

PASSY.

PONT A MOUSSON.

ENG.

E N G L I S H.

KNOWSLEY, in LANCASHIRE,

Is a fine clear light spirituous water, which curdles soap, but not milk; it tastes and smells of iron; if drank to four pints is said to be laxative, though from the small quantity of solid contents, which Dr. *Short* obtained from it by evaporation (see vol. ii. page 129.) one should scarce imagine it to be more so than any other common chalybeate.

A gallon evaporated, yielded him only six grains of residuum, two of ochre, and four of calcareous Glauber salt.

BURLINGTON, in YORKSHIRE,

Is a brisk chalybeate, which does not bear carriage. A gallon evaporated yielded, Dr. *Short* says, (see vol. i. page 230.) thirty-two grains of sediment, of which twelve were a calcareous Glauber salt, twenty a white calcareous earth.

A S T R O P E,

Three miles from BANBURY in OXFORD-
SHIRE,

Is a clear, brisk, spirituous, pleasant tasted chalybeate, which, Dr. *Short* says (vol. ii. page 45, 46, &c.) has wrought many surprizing cures in the gravel, female obstructions, &c. He tells us that it ought to be drank from three to five quarts in the forenoon.

Evaporated, Dr. *Rutty* says, a gallon yielded seventeen grains of sediment, composed of ochre, a calcareous earth, calcareous Glauber salt, and probably some sulphur.

C O V E N T R Y,

In the county of WARWICK,

Is a chalybeate which, Dr. *Short* says, weighs thirteen grains in a pint lighter than common water; that it sits easy on the stomach, goes soon off, raises the spirits, and creates an appetite.

Eva-

Evaporated, a gallon yielded twenty grains of solid matter, twelve ochre, eight calcareous Glauber salt.

B O U R N L E Y, in L A N C A S H I R E,

Is a chalybeate which weighs lighter than common water; it tastes and smells ferruginous, it curdles soap, but mixes smooth with milk.

Evaporated, Dr. *Short* got (see vol. ii. page 130.) thirty-three grains of sediment from a gallon, of which twenty were ochre, and twelve a calcareous Glauber.

T O W N L E Y O R H A N B R I D G E,

In L A N C A S H I R E,

Is a chalybeate of the same nature as the last.

Evaporated, Dr. *Short* (see vol. ii. page 133.) got forty grains of sediment from a gallon, of which he says thirteen grains were sand, twenty-seven grains a calcareous Glauber salt.

He denies that either this or the Bournley contain natron, as Dr. *Leigh* had affirmed.

NEW HAM REGIS,

In the county of WARWICK,

Is a chalybeate which, Dr. *Short* says, tastes hard, rough, steelish, and pleasant^a.

There are three wells which all afford water of the same kind, which has somewhat of a sulphureous smell.

Evaporated, the water yielded in one season, Dr. *Short* says, forty grains from a gallon; in another sixty grains, and in a third sixty-two grains: of the forty grains, sixteen were a light calcareous earth, twenty-four a calcareous Glauber salt.

BINLEY,

Situated two miles from COVENTRY, in the county of WARWICK,

Dr. *Short* (vol. ii. page 45.) says, is a clear pure chalybeate, which is twenty-eight grains in a pint lighter than common water. It is a powerful diuretic, and when

drank to two or four quarts, as is done by the common people, it proves laxative.

Evaporated, (*ibid.* page 131.) he got sixty-five grains from a gallon.

K I N G S C L I F F,

IN NORTHAMPTONSHIRE,

Is a beautiful clear water, that has an irony taste and smell, which, drank the length of three, four, or five quarts, purges strong people.

Evaporated, *Dr. Short* got one hundred and forty grains of sediment from a gallon, of which he says seventy-five were limestone and ochre, sixty-five a calcareous Glauber salt.

Dr. Ratty, who had a sample of the sediment sent him to Dublin, says, that the indissoluble matter in it was not above one sixth part of the whole, and that the salt had a mixture of sea salt with it.

THURSK,

T H U R S K,

In the North Riding of YORKSHIRE,

Is a chryſtalline water, which has an inky ſmell and taſte. Dr. *Short* ſays, it ſparkles like Champaign wine when poured freſh into a glaſs; and that if it be drank from three pints to fix, it purges both by urine and ſtool. It ſtruck a purple with galls, and a green with ſyrup of violets.

Evaporated, Dr. *Short* (ſee vol. i. p. 226.) ſays, a gallon yielded ninety grains of ſediment, forty-five grains of a calcareous white earth that fermented with acids, and forty-five grains a ſaline matter, compoſed of about thirty-fix grains of a calcareous Glauber ſalt, and nine grains of ſea ſalt.

H A R T L E P O O L,

In the biſhoprick of DURHAM,

Is an exceeding fine clear water, which has a pleaſant chalybeate taſte, and ſmells a little of ſulphur. As it riſes from the fountain, it is lighter than common water,
but

but on standing, Dr. *Short* (see vol. ii. page 59.) says, it loses both its sulphur and chalybeate taste, though it deposits no ochre.

It turns of a pink colour with galls, and green with syrup of violets.

Evaporated, Dr. *Short* got from a gallon one hundred grains of sediment, after the well was inclosed; of which he says fifty grains were a light calcareous earth, fifty grains a saline matter, containing two parts of a calcareous Glauber salt, and one part of sea salt.

T H O R O T O N,

Near to NEWARK upon TRENT, in the
county of NOTTINGHAM,

Dr. *Short* says, is the product of the same vein of minerals as Orston. Evaporated, a gallon yielded him one hundred and twenty grains of sediment, eighty of ochre and clay, and forty of calcareous Glauber salt.

ORSTON,

O R S T O N,

Likewise in the county of NOTTINGHAM,
and a few miles from THOROTON,

Is a fine clear water, which has a delicious, gentle, rough, sweetish chalybeate taste, and a slight smell of sulphur.

Dr. *Short* (vol. i. page 222.) says, it is replete with a mineral spirit to a prodigy; when fresh poured out into a glass, it sparkles and flies, and makes the heads of those who drink it very giddy. Two bottles full of this water were let stand all night, and next morning the one weighed twenty-four grains in the pint specifically heavier than at the spring, and the other thirty grains.

By being exposed to the air, it soon acquires a disagreeable, rough, and harsh taste; and it loses its chalybeate properties.

At the spring it strikes a deep purple with galls, and gives a white cloud with alkalies, as it does with a solution of silver; with syrup of violets it becomes first greenish, and then of a pale muddy green colour.

The

The ochre that it dropt, put on a red-hot iron sparkled, stunk, and threw out a blueish flame.

Evaporated, a gallon yielded one hundred and twenty-eight grains of sediment, of which he says ninety-six were earth, and thirty-two a salt, mostly a calcareous Glauber, with a small portion of sea salt.

This water drank in quantity proves purgative, and, like many other chalybeates, makes the tongue, throat, and stools of the drinkers perfectly black.

S T E N F I E L D,

In the county of LINCOLN,

Is a very light, clear, pleasant tasted chalybeate water, and full of spirit; but after it has stood long in its large reservoir, it is very heavy, nauseous tasted, muddy, and full of ochre. It curdles milk and soap. With galls it strikes a purple; with alkalies it exhibits a white cloud, and lets fall a plentiful sediment; with syrup of violets it gives a muddy pearl, which changes gradually to a greenish yellow. It bears

bears keeping, and retains its chalybeate qualities.

Evaporated, Dr. *Short* (see vol. i. p. 214.) says, a gallon, at one time, yielded two hundred and seventy grains, and at another only one hundred and fifty-five grains of sediment.

Of the two hundred and seventy-grains, one hundred and fifty were a calcareous earth mixed with ochre, one hundred and ten a saline matter composed of five or six parts of a calcareous Glauber salt, to one of sea salt; the sea salt did not chrySTALLIZE for a month after the other.

K I R B Y,

KIRBY TOWER is situated three miles from APPLEBY, in WESTMORLAND.

At this place there are two springs which afford a water nearly of the same kind, only the lower one is a stronger chalybeate. The water of both is clear, fine, and has a chalybeate sweetish taste; and drank the length of three or four quarts is purgative.

Dr. *Short* evaporated this water, and from a gallon got one hundred and ninety grains

grains of sediment (see vol. ii. page 132.) of which one hundred and forty were a light calcareous earth and ochre, and fifty a calcareous Glauber salt, which Dr. *Rutty* says, by the trials he made, seems to be purer than what is got from most other Waters. Dr. *Rutty*, in the trials he made with the sediment, got only one fifth of salt, whereas Dr. *Short* had got above one fourth.

T A R L E T O N,

Situated eight miles west of PRESTON, in
LANCASHIRE,

Is a pure clear hard water, which curdles both soap and milk. It is not a strong chalybeate; and it has a faint smell of sulphur when first drawn.

Drank to three or four pints it proves purgative; Dr. *Short*^a evaporated this water, and from a gallon had two hundred and thirteen grains of residuum in one trial, and two hundred and sixty grains in another; of the two hundred and sixty grains, he

^a Vol. ii. page 54.

found one hundred and twenty to be a marly earth, mixed with ochre; and one hundred and forty grains to be a saline matter, composed of one hundred grains of a calcareous Glauber salt, and forty grains of sea salt.

M A L T O N.

This spring lies at the west end of the town of New Malton in Yorkshire; and the water, as it rises up, is clear and of a ferruginous saltish taste, and full of mineral spirit; but Dr. *Short* observes, that its basin is too large, and the water in a manner stagnant in it, and for the most part muddy, full of ochre, and has lost its mineral spirit; by which means it lies heavy on the stomach, instead of passing off easily, as the fresh water commonly does. It strikes first a muddy white, and then a purple, with tincture of galls; a white with alkalies, and gives a pearl colour, with a brownish cloud in the middle, with a solution of silver; and a green with syrup of violets. It bears carriage, and may be kept for months.

Its

Its common dose is from three pints to three quarts ; when it operates by stool and by urine : Dr. *Short* observes, that where the stomach is foul and palled, the water causes vomiting for the first day or two.

Evaporated, a gallon yielded four drachms or two hundred and forty grains of sediment, like rust of iron, of which near one half was salt, the other ochre. Dr. *Short* says, the salt is to the earth as 49 to 51. The insoluble part did not effervesce with acids, and was of a brown colour, like rust of iron ; hence he concludes it to be all pure ochre : however, I do not think he made sufficient trials to know if it had a mixture of the felenite, or other earths which do not effervesce with acids. The salt, in the chrySTALLIZATION he made, turned out to be a pure calcareous Glauber, without any mixture of sea salt, or vitriol ; but he seems to think that at times it contains a small portion of vitriol ; for Dr. *Lister* describes a salt of vitriol which he found mixed with the salt of this water ; and in one of his own experiments, the water with which he lixiviated the residuum of the water, struck

a purple with galls, which is looked upon as one of the marks of vitriol. He reckons it one of the strongest chalybeates in England.

A S W A R B Y,

Situated in the county of LINCOLN, seven miles from GRANTHAM,

Is a fine blueish water, which has a strong irony taste and smell, together with a grateful sweetness; after it had stood some hours, Dr. *Short* says, it turned muddy and full of ochre. With syrup of violets it was first blueish, then very green; with tincture of galls it instantly gave a charming pease-bloom purple; with oil of tartar it was first of a pale white, then blueish. Acids made it perfectly clear, even that which had stood some time.

This water is very gently laxative; operating without griping pains, faintness, or occasioning any pain about the anus; which is a common effect of waters impregnated with sea salt.

Evaporated,

Evaporated, Dr. *Short* got (see vol. i. page 217.) four drachms, or two hundred and forty grains of an ochre coloured sediment from a gallon. He says, this sediment, when dissolved in common cold water, exhibited a very uncommon and surprizing phænomenon, which he never met with before; it turned the water and large chocolate cups into which it was put very warm; the salt dissolved, filtered, and separated from the earth, weighed two drachms, twelve grains, or one hundred and thirty-two grains, which is mostly a calcareous Glauber salt, and one drachm, two scruples, eight grains of earth, composed of ochre and a calcareous earth.

The generation of heat on the mixture of the solid contents with *cold water* deserves to be more accurately examined into, and experiments made to find out the cause of this phænomenon.

SCARBOROUGH, in YORKSHIRE.

The purging chalybeate waters of this place are the most frequented, and more used than any other of this class in England.

We have a very particular analysis given of them by the late Dr. *Shaw*, who attended the water drinkers here for many years.

There are two wells, the one more purgative, and the other stronger of the chalybeate principles than the other; and hence that nearest the town has been called the chalybeate spring, the other the purging; though they are both impregnated with the same principles, but in different proportions; the purging is the most famed, and that which is best known, and generally is called the Scarborough water.

Both these waters are clear and chrystalline, though not so much so as the purer kinds of rock water; when poured out of one glass into another, they throw up numerous air bubbles; and if shook for a while in a close stopt phial, and the phial be suddenly opened before the commotion ceases, they displode a kind of vapour with an audible noise.

At the fountain they have both a brisk pungent chalybeate taste, but the purging water tastes manifestly bitterish, which the chalybeate does not usually do.

Their

Their temperature is nearly the same as that of common water, equally defended from the sun and open air; and their specific gravities nearly the same, though usually both are rather heavier than common water.

Both waters, when fresh, presently strike a dark red, or purple with galls; though the chalybeate does this with greater celerity, and in a higher degree than the other, and both turn fyrup of violets green. They curdle soap, and likewise milk, if boiled with it.

Dr. *Shaw* says, they both make an ebullition with acids, and soon destroy the acidity thereof; an ounce of the purging water will take off entirely the acidity of a drop of rectified oil of vitriol. With alkalies they exhibit a white cloud, and let fall a copious white earth.

They both lose their chalybeate properties and transparency by keeping, or being exposed to the air; but the chalybeate retains them longest.

Four or five half pints of the purging water, drank in the space of an hour, give two or three easy motions, and raise the

spirits. The like quantity of the chalybeate purges less, but raises the spirits more, and goes off chiefly by urine.

Both these waters putrefy by keeping, but in time they become sweet again.

Dr. *Shaw* put four pounds of the *purging water* into a retort, and distilling it with a slow heat to driness, had remaining two drachms, or one hundred and twenty grains of solid matter. In performing this operation, as soon as the water became hot, numerous air bubbles appeared, and a volatile substance or air puffed through the luted point of the retort and receiver: when about one eighth of another parcel of water was exhaled in an open vessel, spangly concretions like dust appeared on the surface, and by degrees more and more of a grained matter fell to the bottom.

Distilled, Scarborough water differs in nothing from common distilled water.

The dry matter, or residuum, left on evaporating these waters, felt somewhat rough between the fingers, dissolved in the mouth, and had a remarkable bitter, saline, roughish taste. This residuum lixiviated and filtered, yielded

yielded one third, or forty grains of insoluble matter, made up of a calcareous, bolar, felenitical, and ochreous earth. The filtered liquor yielded eighty grains composed of two sorts of salts ; between seventy-five and seventy-six grains of a calcareous Glauber salt ; and between four and five grains of sea salt.

Hence we see, that according to this analysis of Dr. *Shaw's*, a gallon of this water, besides a mineral spirit and air, contains about two hundred and forty grains of solid matter, eighty grains of insoluble matter, made up of a calcareous, bolar, and felenitical earth, with a portion of ochre, and one hundred and sixty grains of a saline matter, composed of above one hundred and fifty grains of a calcareous Glauber salt, and not quite ten grains of sea salt.

Dr. *Short*, who likewise analysed this water, says (vol. i. page 174.) that it is weaker and stronger at different seasons ; that he has got sometimes six drachms, twenty-four grains, or three hundred and eighty-four grains of sediment from a gallon ; at other times only five drachms, one grain,

grain, or three hundred and one grains; of this three hundred and one, that one hundred grains were earth, and two hundred and one grains salt, composed of about one hundred and eighty-eight or one hundred and eighty-nine grains of a calcareous Glauber salt, and eleven or twelve grains of sea salt.

And Dr. *Lucas* (see part ii. page 109.) says, he got in London in the proportion of three hundred and twenty grains from a gallon, of which about fifty-four grains were earth, fifty-two calcareous, and two ochre; the rest, or two hundred and sixty-six grains, were salt, of a more hard and consistent nature, than either of those got from Epsom or Cheltenham waters; with a more austere taste, and some tendency to the form of alum in its chrystals; of which he says it will probably be found to partake: but Dr. *Short*, who had searched and tried experiments to discover alum, could find no mark of it in them.

When the humidity is near exhaled, in evaporating this water, Dr. *Lucas* says, it
appears

appears coloured, even after all the ochreous parts are separated by filtration, which is from the oily matter, which is only to be separated by rectified spirit of wine, or by fire. In chrySTALLIZATION it remains with the bittern.

Dr. *Shaw* has not mentioned the solid contents of the *chalybeate water*, but Dr. *Short* has supplied in some measure that defect: he tells us (*ibid.* page 174.) that the solid matter of this water is to the vehicle in the proportion of one, to two hundred and seventy-four and $\frac{1}{3}$; that is, about two hundred and twenty grains to the gallon of water; of this about seventy-seven grains were earth, and about one hundred and forty-three a salt; of which about one hundred and thirty-two grains were calcareous Glauber salt, and eleven sea salt.

CHELTENHAM,

A village six miles from the town of GLO-
CESTER, and in the same county;

Near to which is one of the most noted
chalybeate purging waters in England.

This

This water, as taken up from the fountain, is pretty clear and colourless; but not the most perfectly bright; it has no remarkable smell, and has a saline bitterish and slightly vitriolic taste: if a few drops of an infusion of galls be added to some ounces of the water, Dr. *Lucas* (part ii. page 107.) says, it strikes a pale, but vivid purple instantly.

With syrup of violets it strikes a green, and with alkalies it exhibits a white cloud, and deposits a plentiful sediment. Acids caused an ebullition, made the water more bright, and shewed more air bubbles than ordinary on the sides of the glass; this ebullition Dr. *Lucas* has attributed to the volatile acid in the water, but others to its calcareous earth.

Exposed to the open air in a glass, it throws some air bubbles to the sides, loses its pellucidity, grows more effete, or less smart to the taste, and loses its quality of tinging with galls; and upon standing longer, lets fall an inconsiderable quantity of an ochreous earth.

This

This water curdles soap, but not milk, as most of the other waters of this class do : for Dr. *Rutty* says, that boiled with equal parts of milk, it was curdled but obscurely.

Dr. *Lucas* evaporated a pint of this water, and before it got to a boiling heat, it let drop its ochreous earth, which, when filtered and dried, weighed about half a grain, which is in the proportion of four grains to the gallon. Soon after a terrene pellicle appeared on the surface, which subsided in granules like sand to the bottom : over this, the humidity being exhaled, the salt appeared of a snowy white ; and the whole weighed sixty-eight grains, which is in the proportion of five hundred and forty-four grains from a gallon ; of this one third, or one hundred and eighty-one $\frac{1}{3}$ were earth, mostly calcareous, but with a small mixture of felenite ; the other two thirds, or three hundred and sixty-two $\frac{2}{3}$ were a salt of the nature of Epsom, but which is firmer and drier, and does not absorb the humidity

dity of the air so much, having less bitterness in it.

Dr. *Short* evaporated this water three different times, and each time had different quantities of residuum from a gallon. The first time he had seven hundred and forty-seven grains, of which seventy-four were a light calcareous earth, six hundred and seventy-three a calcareous Glauber salt. Second time, had six hundred and twenty-two grains from the gallon, forty-two earth, five hundred and eighty calcareous Glauber salt. And third time, had six hundred and ninety-two grains, of which seventy were calcareous earth, six hundred and twenty-two calcareous Glauber salt.

Dr. *Short* observes of the salt of this water, that it is freer of sand and earth than the salts of most other waters; that it chrySTALLIZES easier, and its chrySTALS stand longest in the open air of any calcareous Glauber salt he had met with; and have the bitterest and warmest taste of any.

Dr. *Rutty*, who made experiments with this water, says, the proportion of earth was rather larger by his trials than in Dr.

Short's;

Short's; and that although in some of his experiments the salt melted, and rose in blisters like Glauber salt, without crackling, yet that in others it crackled and fled; and hence he concludes there is a mixture of sea salt; and he says, in confirmation of this, that although it made no ebullition with vinegar or spirit of salt, yet it excited a minute ebullition and pungent vapour with oil of vitriol.

This water is drank from one to three pints, as a purge; though in general from half a pint to a quart is sufficient. It operates with great ease; and *Dr. Short* says, is never attended with gripes, tenesmus, or straining at stool.

BAGNIGGE CHALYBEATE.

This water is clear as it comes from the pump, and has a slight irony taste. I mixed a glass of it with tincture of galls, and it struck at first a blueish purple, which very soon became of a dusky muddy red; and it turned of a dark, blackish, yellow, or dun with a watery tincture of rhubarb: it turned immediately white with alkalies;
and

and it exhibited a white cloud with a solution of silver in spirit of nitre, and it turned green with syrup of violets.

Dr. *Bevis* evaporated this water, and got two hundred and forty-three grains of residuum from a gallon, of which one hundred and twenty-five were a soluble salt, and the remaining one hundred and eighteen grains an ochrey earth, with a small portion of selenite.

The Doctor tells us, that on first drinking, three or four glasses commonly operate by stool; but that this effect does not last longer than the first passages are cleared of their vitiated contents.

STOKE OR JESSOP,

Three miles south of CLAREMONT, in the county of SURREY.

This water, got from *Jessop's* well on Stoke Common, is a strong purging water, which has a nauseous bitter taste. When fresh taken up, Dr. *Hales* (Phil. Trans. N° 495.) says, it gave a weak blush with galls, but when put into bottles, it did not do

do so next day. It gives a strong green tincture with syrup of violets.

Dr. *Hales* evaporated this water, and in a dry season he got from a gallon, taken up from the surface, one ounce, two drachms, fifty-six grains, or six hundred and fifty-six grains; whereas after rain, he only got one ounce, or four hundred and eighty grains of sediment.

Of this the $\frac{1}{14}$ part was a fine calcareous earth, the rest a calcareous Glauber salt, which went into fine large chrystals that preserved their solidity, and firmness, longer than the salts of Cheltenham, or other purging waters.

Dr. *Rutty*, who likewise evaporated this water, tells us, that he got from a gallon one ounce, four drachms, twenty-two grains, or seven hundred and eighty-two grains of a sediment, which had a small mixture of a calcareous earth; and that its salt was mostly a calcareous Glauber, but had a mixture of sea salt.

This water drank the length of a quart operates by stool.

Dr. *Hales* mentions a particular circumstance of two people's being severely purged, who stood about three hours in this well, bare legged, to clean it: might this be a useful hint of procuring stools, by bathing the feet in such waters, in cases of obstinate costiveness, where all purgatives are vomited up, and clysters have had no effect?

From these accounts of this water, we see that at the fountain it is but a very weak chalybeate, though a strong purgative medicine; and that by keeping and by carriage it loses entirely its chalybeate properties.

WOODHAM FERRYS, in ESSEX.

It is probable that this water, called a purging chalybeate by *Allen*, should be ranged under this head.

HANLYS CHALYBEATE,

Situated two miles and a half from SHREWS-
BURY.

Near to the purging water, formerly mentioned, is this chalybeate, which is taken
notice

notice of by Dr. *D. Wessel Linden*. He says, that it is a good deal of the nature of the Scarborough water, and of the rock water of Landrindod in Wales.

It is limpid as taken up from the fountain, but on standing becomes of a pearl colour, and then of an ochry, and precipitates a fine ochre. It is brisk and pungent to the taste, and full as pleasant as most chalybeates.

It gives a colour of port wine to an infusion of galls, and a green to syrup of violets.

The ochre which it drops, put into a crucible, and made red-hot, emits a strong sulphureous smell, and gives a blue flame.

Twenty-five ounces evaporated, left one hundred and twenty grains of sediment, which is in the proportion of six hundred and forty-six $\frac{2}{5}$ from a gallon, sixty of which were made up of neutral salts, which shooed into long spangles; and above one half of the other sixty grains, he says, was dissolved iron, mixed with nineteen or twenty grains of a white metal-

lic earth, and six grains of real sulphur or brimstone.

Dr. *Linden*'s account of the contents of this water is very indistinct, and I think the existence of real sulphur in it may be much doubted, and will require a number of very accurate experiments to ascertain the fact.

I R I S H W A T E R S.

A T H L O N E,

In the county of Roscommon,

Is a clear chalybeate, which has no smell and gives a light purple with galls; but loses that property in a few days.

Dr. *Rutty* evaporated this water, and from a gallon got sixteen grains of a residuum, composed of ochre and a calcareous Glauber salt.

The operation of this water is principally by urine.

M O U N T P A L L A S,

In the county of CAVAN,

Is a chalybeate which instantly strikes a claret colour with galls, but very soon loses that property, and does not at all bear carriage.

Dr. *Rutty* says it lathered with soap after some curdling, and made a slight ebullition with oil of vitriol, and turned green with syrup of violets; arguments of some calcareous Glauber salt and earth: but he gives no particular analysis of this water.

K I L I N S H A N V A L L Y,

In the county of FERMANAGH,

Is a chalybeate which bears carriage; it strikes a purple with galls, and a green with syrup of violets.

Evaporated, Dr. *Rutty* got thirty-two grains of sediment from a gallon, which he says was composed of a calcareous Glauber salt, earth, and ochre.

GERMAN WATERS.

CLEVES,

Situated near to the town of CLEVES, in the duchy of the same name.

Is a brisk chalybeate which strikes a purple with galls : and from Dr. *Linden's* account of it, seems to contain a calcareous Glauber salt.

Its operation is principally by urine, the salt not being in sufficient quantity to make it purgative.

DRIBURG,

In the bishoprick of PADERBORN,

Is a brisk spirity chalybeate, which has somewhat of a sulphureous smell ; and is much celebrated in that part of the world, though not much known in England.

Cartbeuser, in his *Rudiment. Hydrolog.* §. 37. page 57. says, that it ought to be ranked among these waters, as containing a calcareous Glauber salt, but he has not given us a particular analysis of it. Dr.

Roederer

Roederer says, it abounds with a volatile acid and mineral spirit; and that it contains sea salt, an alkaline salt and earth, and selenite; see *Comment de rebus gestis in medicin.* &c. *Lipsiæ*, vol. vii. page 356.

H O F F G E I S M A R,

Five leagues from CASSEL,

Is a brisk spirity chalybeate water.

It has an inky taste, effervesces with the mineral acids, turns red with galls, and green with syrup of violets; it becomes white with oleum tartari per deliquium, and with a solution of saccharum Saturni; but not with spirits of sal ammoniac.

Dr. *Rieger*^a says, that a civil pound evaporated, yielded between twenty-three and twenty four grains of sediment, which was made up of sixteen grains of a salt resembling Glauber salt, and seven or eight grains of an earth which effervesced with acids.

This water loses its spirit by transportation, and becomes effete.

^a See *Jo. Ch. Rieger Introduct. in notitiam rerum natur.* &c. *Art. de Acidulis*, who takes this account from Dr. *Jo. Conr. Wagner Krutze's* account of these waters, published at Cassel 1732, in the German Language.

C A R B E N,

Situated in WETTERAVIA, in the territory
of FRIEDBERG.

The Carben water, called Acidulæ Carbenfes by *Hoffman*, is an extraordinary spirity chalybeate. It drops a quantity of ochre in its well and channels, as it does likewise in bottles; and there is a hard stony concretion every where round its well.

Galls give it a blueish brown as taken up from the fountain; and alkalies make it white.

Evaporated, four civil pounds yielded fifty grains of a fixed calcareous earth, and twelve of a neutral salt.

Rieger, who gives this account from *Hoffman*, says, it is diuretic and laxative.

S W A L B A C H,

In the county of HESSE,

These waters are very brisk chalybeates, and full of a mineral spirit. They have a
brisk

brisk vinous chalybeate taste and smell ; but if exposed to the air, they lose their brisk taste ; and *Hoffman* says, they likewise lose their laxative quality.

They turn milky with alkalies, and effervesce with acids. They mix smoothly with milk.

Authors do not seem agreed with respect to the solid contents of these waters. Dr. *Hoffman* says, that two medical pounds yielded near two scruples, or forty grains, which is in the proportion of two drachms, two scruples, or one hundred and sixty grains from a gallon^c ; of this, he says, a third part was a kind of ochre.

Whereas, Dr. *Rutty*, whose accounts is taken from *Commerc. Norimberg. Tom. i.* and *Rieger's Introduct. ad not. rer. natur.* says, a pint, or sixteen ounces, yielded only two grains, which is in the proportion only of sixteen grains from the gallon, which is not $\frac{1}{10}$ part of what Dr. *Hoffman* mentions.

^c If *Hoffman's* medical pound be only twelve ounces, as Dr. *Shaw* makes it in his translation of the *Treatise on the Mineral Waters in Germany*, then an English gallon of this water contains a third part of one hundred and sixty more, of solid contents, or two hundred and thirteen $\frac{1}{3}$ grains.

This

This sediment, he says, turned green with syrup of violets, and effervesced with spirit of vitriol.

These Swalbach waters seem to be of the brisk chalybeate kind, of the nature either of those of the Pyrmont or Spaw: *Hoffman* says, they ought to be placed between the Pyrmont and Egra waters. Further experiments are requisite to determine exactly their nature.

P Y R M O N T.

In the county of PYRMONT,

Is a very brisk spirity chalybeate which, as taken up from the fountain, sparkles like the briskest Champaign wine, and to me had something the taste of the finest old hock, which had lost a great deal of its acidity by age. They have a spirity chalybeate smell, somewhat resembling the smell that arises from water in which iron is dissolving by the vitriolic acid.

Syrup of violets added to them just as taken up from the fountain, very soon becomes of a green colour; I could not observe

serve the least of a red or purple at first mixing, though I looked very attentively.

Oil of tartar occasioned immediately a brownish cloud and turbidness, and the water soon after deposited a whitish brown sediment.

They effervesce with all acids ; and kill fishes and insects thrown into the fountain.

Exposed to the open air, they lost their brisk vinous taste in twenty-four hours, and became turbid, and had let fall a quantity of brown ochreous earth. Dr. *Hoffman* says, that after standing thus exposed, they do not make any effervescence with acids, nor strike a purple with galls, nor even a green with syrup of violets ; but these experiments I did not try.

It mixed smoothly with milk.

Hence we see, that these waters abound plentifully with a mineral spirit and probably contain a volatile acid ; and perhaps would dissolve filings of iron in the same manner as Dr. *Lucas* mentions the Spaw waters to have done.

Dr. *Hoffman* evaporated the Pyrmont water, and got in the proportion of eighty grains of residuum from a gallon. Oil of vitriol

vitriol poured on one half, raised fumes like those from sea salt, when the same acid is thrown on it; spirit of vitriol poured on the other half, made a conflict therewith, and turned it into a bitterish saline substance; and there remained much calcareous earth, which, washed with water, did not effervesce more with acids.

Dr. *Rutty*, who tried experiments with the Pyrmont water when brought to Dublin, says, that although it mixed smooth with milk when cold, yet when boiled with equal quantity of milk, it did evidently produce a slight coagulum.

That in evaporating this water, at different times, he had in one trial one hundred and nine $\frac{1}{2}$ grains, or one drachm, two scruples, nine $\frac{1}{2}$ grains of sediment from a gallon; and in another experiment had two drachms, two scruples, or one hundred and sixty grains.

Dr. *Turner*, who likewise evaporated this water, got one hundred and seventy-six grains from a gallon, of which from sixteen to twenty grains were iron.

Dr.

Dr. *Rutty* says, the residuum was of a pale brown, or white and reddish colour, and had a brackish, nauseously bitter, taste; it did not moisten in the air, as the residua of several other waters do.

Oil of vitriol dropt on it, excited an ebullition; and there arose fumes like those of spirit of sea salt.

The residuum yielded about one third part of a salt, which answered to all the the characteristics of a calcareous Glauber salt, in the figure of its chrystals, in its coagulating milk, &c. The remainder was made up of a calcareous earth, selenite, and ochre.

From what has been said, we see that the quantity of solid contents of this water varies at different times, yielding from eighty to one hundred and sixty grains from the gallon: that one third of this is a pure calcareous Glauber salt; that it likewise contains a portion of sea salt, and that the remainder is made up of a calcareous and selenitical earth and ochre.

People commonly drink this water by glass-fulls in a morning, to one, two, three,

or more pints, and walk about between each glass: its common operation is by urine; but if taken in large quantity, it often proves laxative; but when it is wished that it should have this effect, it is common to mix some salts, with the first glasses that are drank in the morning.

It is one of the pleasanter and most useful chalybeates known, and possesses most of the virtues attributed to the Spaw waters in a high degree, and at the fountain is more spiritous, and it is a much stronger chalybeate.

L I E B E N S T E I N,

In the county of HENNEBERG.

Dr. *Rieger* says, is a very spiritous chalybeate, which agrees in taste with the Pyrmont, but is rather milder and less pungent.

T U P P O,

Situated two miles from the CAROLINE Baths in BOHEMIA.

This water Dr. *Hoffman* * says, approaches very near in every respect to the Pyrmont water.

* Hoffm. Opusc. 11. page 183.

E G R A,

E G R A,

Situated in BOHEMIA, about half a mile
from the town of EGRA,

Is a fine, clear, light, spirity water, which strikes a purple with galls at the fountain, but not after being carried to a distance, unless the vessels in which it is kept have been very exactly stoppt. With syrup of violets it turns of a dilute green colour; and with spirit of vitriol it causes an ebullition, though not so strong as the Pyrmont water.

Dr. *Hoffman*, who gives this account says, that it continued clear and limpid upon mixing oleum tartari per deliquium with it, and that no milkiness, cloud, or precipitation ensued. If this fact is true, it is probable that the purging salt got from this water is rather a *true Glauber salt*, whose basis is the native alkali or natron, than a calcareous Glauber, whose basis is an earth; for alkalies, mixed with solutions of this last named salt, always cause a milkiness and precipitation. Dr. *Rutty* tells us,
that

that *Swedenburg* observed a milkiness and a white precipitation ensue on the mixture of the lixivium of tartar with this water; however, as *Dr. Hoffman* has so positively asserted the contrary, further trials ought to be made to determine which of these gentlemen are right in their observations.

Dr. Hoffman evaporated, by a mild heat, a pint of this water, and had left twenty-four grains of solid matter, which is in the proportion of three drachms, twelve grains, or one hundred and ninety-two grains from a gallon. Oil of vitriol dropt on this sediment caused no effervescence, nor raised any volatile acid vapour; hence it contains no alkaline salt, calcareous earth, or sea salt.

A purging salt is prepared from these waters in the same manner as from our Epsom water.

These waters drank to pints operate both by stool and urine.

E L S T E R.

Dr. Rieger, in his introduction to the knowledge of natural things, says, that
the

the waters of Elster Sauerling in Voigtland, on the confines of Bohemia, are so like to those of Egra, that they cannot be distinguished from one another.

H R A N I C I U M.

From the accounts given by Dr. *T. Jordan*^d of these waters, I should suspect, that on examination they will be found to be brisk chalybeates, approaching a good deal in their nature to that of Pyrmont; however, till further trials, I shall not affirm that they ought to be placed here, or that they are even chalybeates; but, as they seem to be useful mineral waters, I shall here subjoin Dr. *Jordan's* account of them.

He says, these waters are situated in the suburbs of the town of Hranicium, on the river Beezua in Moravia: they smell sulphureous, on first entering the room where the bath is, but that smell goes soon off; and they cover the insides of the kettles in

^d Vide *T. Jordan de Aquis medic. Moraviæ Commentariolus*, Edit. 1586.

which they are often boiled, with a stony crust.

When Dr. *Jordan* first arrived at this place, the bath was covered with a scum, for it had not been emptied for a considerable time; and this scum had a bitumenous appearance, but on examination it rather seemed to be composed of a fine earth. The water then in the bath had a sharp disagreeable taste, which at first affected the point of the tongue, but on being held for some time in the mouth, it lost its pungency, though it still retained its disagreeable taste. On opening the conduits, a quantity of reddish brown or saffron coloured ochre, or earth was taken out of them.

The Doctor made the sluices of the bath be opened, and let out the water; and next morning what was again collected was sharper, more acid, and affected the teeth with a stupor, as the spirit of vitriol is wont to do.

Frogs thrown into these waters die immediately; and no fish are ever found near, to where a spring of this water rises up in the bed of the river Beezua.

The

The bath is said to contract the skin, especially of the genitals, so much, that no body can remain in it above a quarter of an hour.

The fresh water, on being evaporated, left a whitish sediment, which the Doctor suspected to contain vitriol, a calcareous earth, and ochre: though afterwards, on distilling them to driness, and then raising the heat so much as to sublime even part of the sediment, it appeared to him to be nothing but an insipid earth. He says, if there is any sulphur, it is in such small quantity, that it may be reckoned next to nothing.

Before rain, the water of the Bath becomes turbid.

At the bottom of the hill, a few steps from the Baths, the Baron Kropac, on whose estate they were situated, ordered some workmen to dig, suspecting that these waters were warm in the bowels of the earth; but the workmen had not dug far, before there came out such a suffocating steam as made them desist; and in attempting some time after to dig a-fresh, one

man was suffocated with the vapour ; and it has been found, that animals soon die when thrown into this pit ; in the same manner as at the Cave at Pyrmont, when the vapour is strong.

U N T E R E P P A C H,
In the district of HOHENLO,

Is an extremely limpid water, which emits a number of air bubbles. It has an astringent taste ; fishes and frogs thrown into it die immediately ; and drank in quantity, it affects the head. Dr. *Rieger* observes, that Dr. *Hoffman* says, it becomes white with the fixed alkaline salts, but is not affected with the volatile ; and it becomes turbid and white with a solution of the sublimate mercury. It strikes a purple with galls, and a green with syrup of violets ; and becomes intensely red with spirit of vitriol.

Distilled, the water which came over had somewhat of a sulphureous empyreumatic taste ; and the sediment left had the appearance of a yellow, porous, bolar earth, which, when lixiviated, yielded a neutral
salt

salt of the nature of Epsom, in which the alkali was predominant; and there remained a little white alkaline earth, which fermented with acids.

FRENCH WATERS.

P A S S Y,

Situated within a few miles of PARIS,

Is a clear limpid water, which has a sub-acid chalybeate taste, and ferruginous smell; it emits plenty of air bubbles, and strikes a dark blue colour with galls.

Several of the French academicians have analysed these waters, but they do not agree in the accounts they give of them.

Mr. *Lemery*, in the Memoirs of the Academy of Sciences for 1701 (Edit. 8vo, Hist. page 78.) tells us, that this water, taken up immediately from the fountain, turned the tournsol red, but produced no such effect after it had stood but for a short time. Mr. *Boulduc*, on the contrary, affirms, in the Memoirs for 1726 (Edit. 8vo Mem. page 432.) that this water turned the tinc-

ture of violets instantly green, though mixed with it as just taken up from the source.

The French authors likewise differ much with respect to the proportion of solid matter to be got from them. *Du Clos* says, it is $\frac{1}{709}$ part of the whole, which is in the proportion of between eighty-five and eighty-six grains to the gallon: whereas Mr. *Geoffroy* junior alledges, in the Memoirs of the Academy for 1724 (Hist. page 72. Edit. 8^{vo}) that he got from thirteen to eighteen grains from eight ounces of the water, which is in the proportion of two hundred and eight grains, and two hundred and eighty-eight grains from the gallon.

They all agree, that the residuum is made up of a talky matter, ochre, and salt; but have not given us the exact proportions of each.

Du Clos says, one third of the residuum is a salt not unlike sea salt, which caused a coagulum with a solution of salt of tartar.

If Mr. *Geoffroy*'s account is just, it should seem to be a strong chalybeate; for he says, it struck a colour with galls exactly the same

as

as a solution of twenty grains of sal martis, in eight ounces of water.

Mr. *Boulbuc*, who analysed this water, mentions in the Memoirs of the Academy of Sciences for 1726, that, in evaporating, it became turbid, and deposited its ochre when hot; and that some time after, an earthy pellicle appeared, which broke, and fell to the bottom; and after this another, and successively several others. When the whole water was evaporated, he found the residuum to be made of three or four different matters, laid one above another in layers. The lowermost was the chalybeate, or ochry earth; above this was a layer of shining little chrystals, which proved to be selenite; and above this lay a confused mass, which had a saltish taste, and liquefied on being exposed to the air; by lixiviating and chrySTALLIZING this saline matter, he obtained two sort of salts, a marine and a Glauber. The residuum was mixed with an oily matter, which seemed to be no more than what is common to all waters.

This water is a strong chalybeate, but does not contain so much salt as to prove

purgative, unless it be drank in large quantity; though it has sometimes both vomited and purged weak people, and those whose stomachs have been foul, or otherwise disordered.

PONT A MOUSSON,

In the duchy of LORRAINE,

Is a chalybeate water, which at the spring gives a red approaching to a violet with galls; and soon after deposites a sediment of the same colour. Dr. *Pacquotte* ^c, who analysed this water, says, that two pounds of the water, when evaporated, left fifteen grains of a yellow very bitter salt, and eighteen grains of a yellow earth. The salt, when put into a red-hot crucible, gave a sulphureous smell, and a blue flame; it did not effervesce with acids, but seemed to be of the nature of Espom salt.

^c See *Rieger Introd. in notitiam*, and *Journ. des Sçav.* 1719. page 349.

S E C T. VI.

OF CHALYBEATE WATERS
WHICH CONTAIN ALUM.

FORMERLY many waters were thought to contain alum, but since chymistry has been so much improved, and mineral waters examined with care, it has been found, that none almost of those waters which have been called aluminous, have the least grain of alum in their composition.

Dr. *Hoffman* ^b says, that in all the experiments he made, he discovered no signs of alum in any mineral water; nor did there appear any marks of it in any of the experiments made with mineral waters, before the royal academy of sciences at Paris ^c.

Dr. *Hoffman* ^d however does not deny, but that springs may be found which

^b *Hoffman on Mineral Waters*; Dr. *Shaw's* Translation, Edit. 2d. page 53. §. 53.

^c *Du Clos de Aquis medicatis Galliæ.*

^d *Ibid.*

abound

abound with alum, in those places where alum stone is found and dug : hitherto the *Somersham* in *Huntingdonshire* seems to be the only water we have an account of, in which (if no mistake has been committed in the experiments) alum has been proved, beyond a doubt, to exist.

ENGLISH WATERS.

S O M E R S H A M.

Dr. *Peter Layard*, physician to her royal highness the princess of Wales, in the 56th volume of the *Philosophical Transactions* for the year 1766, gives the following account of this water.

It issues from the declivity of a small hill, between St. Ives and Somersham, in the county of Huntingdon. The water flowing from the spring runs through brick channels into a brick basin.

The water taken up at the basin is generally clear and transparent, unless after heavy rains, when it appears thick, and of a muddy yellow; or when the basin has not
been

been cleaned for some time, lumps of a black gelatinous substance, like the sediments in ink bottles, are taken out of the bottom of the basin.

The water taken up, by dipping carefully a glass into the basin, in a dry season, and in fair weather, is quite clear, and full of air bubbles sparkling up, some of which stick to the sides of the glass.

By the hydrostatical balance, its weight at the well, is to that of distilled rain water, as one thousand and six $\frac{1}{2}$ to one thousand; but when carried to Huntingdon, as one thousand and one to a thousand.

At the spring it is cool, pungent, and of an austere, sharp, astringent, ferruginous taste, somewhat inky, but not in the least disagreeable.

When carried to any distance it loses of its pungency, by its suffering a decomposition; but when it is carefully bottled under water, and then corked and sealed, it preserves its briskness and volatility a long while. By keeping only in a corked bottle, it preserves its iron principle for months.

months, or even years, so as to turn of a purple, or of a dark blue colour with galls.

At the fountain, half a grain of galls turns a pint of a dark purple.

No acids make any change of colour; and it preserves its transparency.

All alkalies cause an effervescence, and turn the water green, and curdle it.

When cold it mixes smoothly with milk, without producing any alteration; but boiled with equal quantities, it turns it immediately; the curd becomes of a bright purple with galls, and the whey of a reddish brown; and both are of an agreeable, rough, and ferruginous taste.

It curdles a solution of soap, and turns syrup of violets immediately green.

When carried to Huntingdon, half a grain of galls turned a pint of it of a mazarine blue, inclining to purple.

Filings of iron turned it black, and by standing it precipitated a black sediment; and then the water remained clear.

It did not effervesce with alkalies, as at the fountain; but it became cloudy, and dropt a sediment.

Let

Let stand in an open bottle, it in a few hours drops an ochry sediment, and continues clear and transparent, and then, after being kept for months and years in bottles only half full, it still turns purple with galls, though in a lesser degree.

The water separated from the ochre, which precipitates to the bottom of the bottles, by being exposed for some hours to the open air, if put on the fire, emits many air bubbles, then grows turbid and yellow; and after a little evaporation throws up a thick scum, which, when separated by filtration, proves to be a fine ochre beset with felenites.

After this separation it appears greenish at the top, and lets fall a white sediment; and when evaporated to half an ounce, a thick pellicle is formed.

If to this residuum a small quantity of distilled rain water be added warm, and then filtered, a very white sediment will be separated; and the water, on being evaporated to a pellicle, will leave a brown deposit, which will appear to be a bitter muriatic salt, containing sometimes a few chrystals.

Some

Some leaves of the herb *ragged Robert* (*Geranium Robertianum*) were put into three different phials.

1. The first contained four ounces of the Somersham water.

2. The second four ounces of distilled rain water, with two grains of alum.

3. The third four ounces of distilled rain water.

These three phials were put into sand, kept of a moderate heat for twenty-four hours, and then examined.

1. The water in the first phial was of a purple colour, with a reddish hue, and the herb of a purple.

2. The water of the second of a green, with a reddish colour, and the herb of a yellow green.

3. The water of the third of a fine green, and the herb of a bright green.

By evaporation, four pounds in a dry season, yielded from sixteen to twenty grains of a rusty orange coloured sediment; whereas after rainy weather, two pounds have yielded one drachm of a dark olive sediment.

Two drachms of the yellow ochry sediment, put into a crucible, covered with a tile, and calcined in an open fire, lost $\frac{1}{6}$ of their weight; the residuum appeared of a red rusty colour, mixed with a white earth, and a small quantity of a greyish powder stuck to the sides of the crucible; the red powder was partly attracted by the magnet.

Some of the white powder, obtained by diluting the sediment with distilled rain water, made warm (as above-mentioned) and then filtered, being put on a red-hot iron, partly blistered up, and turned of a greyish colour, and the remainder, which was the greater quantity, appeared of a very clear white.

Some of the felenites obtained by evaporation and filtration, being put on a red-hot iron, partly swelled up like blisters; and when cold, appeared of a greyish white, intermixed with particles of iron.

From these experiments, Dr. *Layard* concludes, that the Somersham water is strongly impregnated with a vitriol of iron and alum, and contains likewise some calcareous earth, felenites, and salt.

Dr.

Dr. Morris made likewise a number of experiments with this water, and confirms what Dr. *Layard* has said of its contents; and adds, that he obtained by evaporation five grains of regular chrystals of alum from two pounds of this water.

Dr. *Morris* says, that if we consider that alum is composed of the vitriolic acid, united to an argillaceous earth, it will not be difficult to conceive that an acid water, passing through a stratum of such earth should act upon and dissolve a small quantity of it; or that the water may dissolve some alum in the stratum of decomposed pyrites, where it is impregnated with iron and selenites, so that probably alum has been often overlooked in waters wherein it naturally existed; for we did not obtain any alum in our experiments until nearly all the selenites had been separated.

The season for drinking this water is from May to October^a.

It is commonly drank in a morning, the length of three glasses, at half an hour's distance from each other; but some per-

^a See Dr. *Layard*'s separate treatise on Somersham water.

sons can bear half a pint or more at a draught; while others cannot, or should not drink so much as a quarter of a pint.

Dr. *Layard* observes, that it is always proper to purge before a course of these waters, and likewise after the course is over.

This water may be mixed with salts, and a little warm water, when we intend to purge; and preserved carvy or cardamom seeds may be eat, after drinking it: and it may be at other times mixed with milk.

He recommends its use in debilities of the stomach and bowels, in dysenteries, hæmorrhoids, and worms; in nidorose crudities, but not in acid; in obstructions of the liver and spleen. In uterine complaints; in stone and gravel; in hysteric and hypocondriac complaints; in the scorbutic marasmus, and other disorders.

Externally it is applied to foul ulcers, and cancers.

S E C T. VII.

OF CHALYBEATE WATERS IMPREGNATED WITH A PECULIAR SORT OF CALCAREOUS GLAUBER SALT, WHICH WERE THOUGHT TO CONTAIN ALUM.

ALUM has long been esteemed an ingredient in mineral waters, but since more accurate experiments have been made, the waters called aluminous have in general been found to contain none of it, but other salts, which have some of its properties.

Dr. *Short* formerly alledged, that he had obtained true chrystals of alum from the *Nevil Holt water*; but by later experiments, he says, he has discovered his mistake; and found that this water is only impregnated with a species of the calcareous Glauber salt, and certain peculiar sorts of earth; and perhaps, the Ballycastle water, called aluminous by Dr. *Rutty*, may hereafter be found

not

CHALYBEATE WATERS, &c. 435

not to contain alum; for if it prove universally true what Dr. *Short* has affirmed^a, that alum stone taken fresh out of the earth, gives no taste of alum to water in which it is infused, or even boiled, before calcination, it is probable that we shall find fewer waters impregnated with alum, than might have been expected; except near to volcanoes, or places where there are subterraneous fires, or near to alum works; though the analysis of the Somersham waters given by Dr. *Layard* and Dr. *Morris*, shews, that such waters may likewise be found in other parts of the earth.

^a See his general *Treatise on various cold Mineral Waters* in England 1765, page 180.

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The waters which were thought to have contained alum, which we shall at present consider, are,

<i>ENGLISH.</i>	<i>IRISH.</i>
NEVIL HOLT.	BALLYCASTLE.

NEVIL HOLT OR HOLT,

Situated near to MARKET HARBOROUGH,
in LEICESTERSHIRE.

This water issues from a thin stratum of black earth, in form of a dew, which gathers into drops which fall into a stone spout, that conveys it into a clean stone basin, which contains about forty gallons.

As it falls from the spout, it is exceedingly clear, and void of all smell. It has a brisk, austere, bitter taste, and yet is not disagreeable; in general it sits easy on the stomach, except with people of delicate constitutions, or it be drank in too great quantity, or immediately before or after milk.

If shaken in a bottle half full, with the thumb covering the mouth of the bottle,
it

it emits numerous air bubbles, and gives a smart explosion on removing the thumb.

Dr. *Short* says^d, it weighs fifty-nine grains in the pint heavier than common water; and increases eighteen grains in weight, by being carried to the house.

After great rains, or sudden land floods, it strikes a purple with galls; but at other times it gives but faint marks of a chalybeate impregnation, and is stronger of its salts.

When it has stood long in its basin, it lets drop an intolerable fetid, thick, jelly like matter; but if it be received into clean bottles from the spout, and the bottles be well corked and sealed, it drops no sediment, but remains clear and fresh, and may be carried to any distance.

It decomposed soap; and curdled milk, when boiled with it; it turned pale, clear, and blueish with galls, but after three days changed to a green: it struck a purple with logwood, and a pale pink with the *Armeria pratensis*, or meadow pink. It made no ebullition with alkalies, but exhibited a pearl,

^d See his 2d *Quarto Volume*, page 48, and his *Treatise Octavo*, published in 1765.

blue and white yellowish cloud and sediment. Part of the acid in this water is in a semi-volatile state; for after the water has stood long in the open air, it does not so readily curdle milk, as when fresh; and if this water be boiled down till it become a strong ley, and be put, while it is yet warm, into a room where there are vessels and instruments of copper or iron, its vapour will corrode them.

If this water be evaporated in a hard earthen or porcelane dish, Dr. *Short* saysⁿ, that the sediment left always divides itself into three parts. 1. For about two or three inches high, on the sides of the vessel, is a strong, thick, stiff, glutinous substance, of the colour of hard glue, but more tenacious and stiff than Burgundy pitch; it sticks so fast to the sides of the vessel, that it cannot be separated, till it is cold, and then it exactly resembles a clear transparent gum; and when scraped, comes off in small scales, or flakes, like rosin, or frankincense; it tastes very rough and astringent; and when powdered, is white as flour; if kept for

* See 2d Quarto vol. page 273.

two or three hours warm on a sand heat, it still remains a stiff glue; if you give it a greater heat, it makes a noise, and blebbing like alum calcining, till it is dry.

2. At the bottom of the vessel lies a dry sediment, curzled and white above; this is very tart, bitter, cooling, and somewhat restraining; being chiefly a calcareous Glauber salt, mixed with a peculiar sort of earth.

3. Under this is a very salt brownish dust, or powder; which is chiefly clay, and a calcareous Glauber salt.

He observes, that none of these three matters are so obvious, when the water is boiled away in brass or copper vessels over an open fire.

This water evaporated, yields different quantities of solid matter, according as the weather had been wet or dry. Dr. *Short*, in his late account of it^s, says, that in the time of the excessive rains in 1739, an ale gallon left an ounce and a drachm, or five hundred and forty grains of sediment.

* See his general Treatise on various cold mineral waters in England 1765,

In the great drought in summer 1741, it yielded a scruple more, or five hundred and sixty grains. In the year 1757, only an ounce, or four hundred and eighty grains.

Dr. *Rutty*, who evaporated different specimens of this water, which were sent to Dublin, tells us, that he obtained from a gallon from five hundred and eighty-four grains, or one ounce, two scruples, four grains, to eight hundred, or one ounce, five drachms, one scruple. The different manners of evaporating this water, and the different seasons at which the water was taken up, probably was the cause of the great difference of the quantity of solid matter or residuum, which Dr. *Rutty* and Dr. *Short* got from a gallon of this water. Dr. *Short* observes, that one obtains a larger proportion of residuum, by evaporating with a gentle heat, than when a strong fire is used, and the water is evaporated quickly.

Dr. *Rutty* says, the residuum of this water has a singular strong smell, and an acid, austere, bitter taste, as the water itself.

itself. One specimen, he says, turned first red with syrup of violets, and then green; but another became immediatly green; and that one specimen lay intirely still on the red-hot iron, but another rose in large blisters.

The residuum or sediment is composed of an earth and a saline matter.

The earth, Dr. *Short* says, is about a third or a fourth part of the whole: but Dr. *Rutty* tells us, that the proportion of it is much less, and that he got only from one sixth to one eighteenth.

In boiling the water to obtain the solid contents, most of the earth falls to the bottom, long before all the water is evaporated; and may be separated by decanting off the ley, charged with the salts. Dr. *Short* mentions † his having evaporated thirty-four gallons to thirteen quarts; during the boiling, the liquor made a constant loud rattling noise, and dropt six ounces of a fine white filky, greasy like earth, in thin snow white cakes; which, being taken out and

† See his general Treatise, &c. in Octavo, 1765, page 146.

well washed in rain water, were white, soft, and tasteless. The remaining thirteen quarts of ley, being evaporated to dryness, left sixteen ounces of a dry white sediment, which contained only ten grains more of earth.

This earth, which is at first white, silky, and floccy, like flowers of Benzoin, by keeping, falls down into a whitish grey powder: and Dr. *Short* says, it is composed mostly of talk and selenite, mixed with a little calcareous earth, sand, or marl; Dr. *Rutty* alledges, that the earth is rather a fat bole or clay, than a calcareous earth; and that it is often, if not always, mixed with a portion of ochre.

Dr. *Short* says *, when the sediment is washed in distilled warm water to dissolve the salt, that its earth often separates into two different sorts, viz. 1. White or grey flakes, which neither ferment with acids nor alkalies. 2. A reddish brown clay or powder, which, when it has parted with its rough, bitter, calcareous Glauber salt is quite insipid; but the first mentioned earth does not readily part with its salts, for after it has been lixiviated several times,

* See 2d Quarto vol. page 274.

with distilled water, it still retains a sensible, rough, aluminous taste.

The salt of this water, when it is crystallized, proves to be a calcareous Glauber; which, Dr. *Short* says^z, has a rough acid taste, and contains considerably more acid than the purging salts; the acid having left the other earths, and attached itself to the basis of this salt; and he alledges that it is the additional quantity of acid, and not alum, which gives the salt the austere taste; and as a further proof of this, he says, a solution of this salt raises a strong effervescence with alkaline salts, attended with smok, heat, and a hissing noise; and that this salt is so strong, that it does not sit easily on the stomach, even in the small dose of ten or twelve grains.

He had formerly alledged, that he had got true crystals of alum, from a strong ley of this water, after it had stood two months; but in his late Treatise of 1765, he tells us, that he had mistaken the small white earthy floccules, lying between the dry saline crystals, for alum.

^z General Treatise, Octavo 1765, page 156.

Dr. *Rutty* could obtain no other salt from this water, but a calcareous Glauber; which he believed to be mixed with a small portion of alum, from its having such an austere acid taste, and from Dr. *Short's* having formerly affirmed, that he had once got true chrystals of alum from the strong ley of this water.

Dr. *Short* affirms, that the salt of this water is one of the strongest antiseptics in nature; for that it not only prevents putrefaction in meat, and other animal substances, but even renders them sweet after they have become putrid; he says, he put fourteen grains of this salt into two ounces of very fetid blood, which had stood two months in a warm room in a close stopt bottle; and that after shaking the bottle, and letting it stand twenty minutes, it became quite fresh: he then put six scruples of this salt into two other ounces of the same fetid blood, and it instantly rendered it sweet.

He mentions another property of this salt as peculiar to it; which is, that mixed with snow, it lowers *Fahrenheit's* ther-

thermometer five degrees more, than nitre mixed with snow.

From the whole, we see, that this water contains a peculiar species of the calcareous Glauber salt, and a quantity of different earths, principally of the talky and felenitical kind; which are all originally dissolved and suspended in the water, by means of a vitriolic acid, which is in a semivolatile state; that it often gives strong marks of a chalybeate impregnation, and that at all times, some marks of it are to be observed on torturing the residuum left after evaporating the water; to all which we may add more or less of an oily or bituminous matter, common to all waters.

This water drank to pints, operates as a purgative medicine. Dr. *Short*, in his 2d Quarto Volume, says, that this water should be drank in different doses, according to the various intentions in using it; for where deterging, bracing, and invigorating emaciated, atrophic bodies, is only designed, from half a pint to a pint of the water is sufficient; but where evacuating, drying up, and healing is intended, from a pint to two pints and a half is required.

It

446 BALLYCASTLE.

It operates more freely as taken up from the fountain, than after it is kept, and it proves a brisk purgative and powerful diuretic. Dr. *Short* recommends it as one of strongest antiseptics in putrid disorders; in old dysenteries, and diarrhœas; in internal hæmorrhages; in the fluor albus, and gleans; and in the gravel and stone, and many other chronic complaints.

IRISH WATERS.

BALLYCASTLE,

In the county of ANTRIM, springs from a mountain about a hundred yards distant from the sea mark,

It is particularly described by Dr. *Rutty*, who says, it is a clear limpid water, has an acid austere taste, which resembled a weak solution of alum, mixed with an infusion of the lapis Hybernicus. It seemed to betray something of a brassy taste, and gave a copper colour to the blade of a knife.

The

The ground over which it runs, is in some places tinged with an ochre; in others it is covered with a white slimy substance.

Syrup of violets mixed with the water, kept its blue colour; logwood made it of a bright red; which, by standing, changed to a crimson. Galls struck a dilute, but fading blue colour.

It exhibited a whitish cloud, and sediment with alkalies, which had neither an ochreous nor greenish cast. It decomposed soap, and curdled milk, when boiled with it; but remained clear with a solution of alum.

It did not tinge black the corks of the bottles, in which it was brought from Dublin.

In evaporating this water, Dr. *Rutty* observes, that there were three different sorts of substances.

1. An ochre floating in it, which afterwards subsided to the bottom.
2. Above this a green circle, as of vitriolum Martis.
3. Below this a white matter, which had the taste of alum.

A gal-

A gallon, in one experiment, yielded sixty grains, or one drachm of sediment; in another but forty-eight grains, which had a whitish brown colour; of an acid, rough taste like alum, combined with a little vitriol. It struck a deep blue with galls; it made an ebullition with spirit of sal ammoniac, but not with the lixivium tartari. It curdled milk; it rose on the red-hot iron into blisters; it emitted a strong pungent smell, when rubbed with salt of tartar, even as alum does; and it struck a crimson with a decoction of log-wood.

From the whole, the Dr. seems to think, that this sediment contains a portion of alum and vitriol, combined with an earth, which does not effervesce with acids; and he suspects from the colour it gave the blade of a knife, that it contains a pittance of copper; and from its sparkling and stinking when put on the red-hot iron, that it also contains some sulphur; but this seems to me to be only owing to the oily matter, which is to be found in every water.

He

He says, this water contains no calcareous Glauber salt, as the Nevil Holt does; and that the water had not hitherto been applied to medicinal purposes.

This account certainly gives us strong reason to suspect an aluminous impregnation, though the Doctor has produced no certain proofs of the existence of alum in the water, and therefore it ought to be more particularly examined. Large quantities ought to be evaporated over a slow fire, and proper trials made with the sediment, for obtaining pure chrystals of alum from it, or other certain proofs of its existence in the water; or if there is no alum, to find out the nature of that white matter, which the Dr. seems to have taken for it.

Dr. *Rutty* says, that he has not yet been informed of any medicinal uses this water has been applied to, excepting that Dr. *Smyth* had given it with success, as an auxiliary medicine in a violent uterine hæmorrhage.

From the analysis, he does not think that it is intitled to any share of a purging
VOL. I. F f quality,

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quality, but that it must undoubtedly be a more powerful bracer, corroborator, and styptic, dryer, and repellant, *cæteris paribus*, than the merely chalybeate, and the merely vitriolic waters equally impregnated; and as such, he recommends it for trial.

S E C T. VIII.

OF CHALYBEATE WATERS, WHICH HAVE A STRONG SULPHUREOUS SMELL.

THE waters, we are now to consider, have the general virtues of chalybeates, joined to those of the other mineral substances with which they are impregnated; and as they have a strong sulphureous smell, they have been esteemed particularly useful in cutaneous disorders.

All chalybeate waters have somewhat of a smell of sulphur; and hence Dr. *Rutty*, and many other authors, have alledged, that all of them contain more or less sulphur; but in general, this smell should seem to be occasioned by a mixture of that vapour

vapour or steam which followed the solution of the iron with which they are impregnated, by means of the vitriolic acid, in the bowels of the earth.

At present we shall only consider a few of them, where the sulphureous smell is strong, and so remarkable, that the waters have been called sulphureous, which are,

ENGLISH.

DEDDINGTON.
DRIG WELL.
INGLEWHITE.
GAINSBOROUGH.
THORP ARCH.

IRISH.

CASTLEMAIGN.
BALLYNAHINCH.

GERMAN.

POLZIN.
KUPFERZELL.

SPANISH.

VIANA.
SUIDIS.

ENGLISH.

DEDDINGTON,

IN OXFORDSHIRE, four miles from BAN-
BURY,

Is a chalybeate water, which has a strong sulphureous smell, like to the washings of a foul gun.

It strikes a pink colour with galls at the fountain, but it loses both its chalybeate properties, and its sulphureous smell in a very short time; and by being carried a few miles.

Dr. *Short*, who evaporated this water, says, that a gallon yielded eighty-seven grains of sediment, of which forty-four were an insoluble matter, a kind of clay, and forty-three were sea salt.

Dr. *Rutty*, who gives an abstract of Dr. *Plot*'s account of this water, thinks, that the salt was a natron or native alkali, and not sea salt; because the water lathered smooth with soap, did not curdle milk, and turned green with syrup of violets. He mentions, that Dr. *Plot* has alledged, that a quart of this water is an ounce and a half lighter than common water, but I suspect this is a mistake, for I know of no other mineral water that is so much lighter than common water.

This water drank in large quantity is purgative.

D R I G W E L L,

Situated a mile from RAVENGLAS, in
CUMBERLAND,

Is a clear, pleasant, brisk, spirituous chalybeate, which has a strong smell of sulphur, but loses it in a few hours after it is taken up from the fountain. Dr. *Short* (see 2d Quarto Vol. page 63.) says, it retains its chalybeate properties both after being carried some miles, and after being kept for some days. He has not given us a particular analysis of this water.

I N G L E W H I T E,

In the county of LANCASTER,

Is a strong chalybeate, which has a strong sulphureous smell.

Dr. *Short* evaporated this water, and got from a gallon (see vol. ii. page 134.) twenty-four grains of sediment; of which, he says, nineteen grains were an ochreous earth, and five grains a calcareous Glauber salt.

G A I N S B O R O U G H,

In LINCOLNSHIRE,

Dr. *Short* (vol. ii. page 69.) says, is a weak sulphureous chalybeate.

He evaporated this water, and got one hundred and ninety-two grains of sediment from a gallon; of which one hundred and twenty grains were a light calcareous earth, and seventy-two grains a calcareous Glauber salt.

Drank to pints it is purgative.

THORP ARCH OR CLIFFORTH,

In YORKSHIRE, four miles from WETHERBY and TADCASTER,

Is a pure, brisk, salt chalybeate, which proves purgative. An ale gallon yielded one ounce, six drachms of sediment, twenty-five grains of which were a white alkaline earth, the rest sea salt.

I R I S H W A T E R S.

C A S T L E M A I G N,

In the county of KERRY,

Is a chalybeate which strikes a deep claret colour with galls, and has at the same time a strong sulphureous smell, like the scourgings of a foul gun barrel; it loses its sulphur smell soon, though it retains its chalybeate properties long. Dr. *Rutty* says, that a gallon of this water evaporated, left eleven grains of an ochre coloured sediment, which had a brackish taste.

B A L L Y N A H I N C H,

In the county of DOWN,

Is a clear very cold chalybeate water, which has a strong sulphureous smell.

Dr. *Rutty* says, it coloured metals, struck a purple with galls, lathered smooth with soap, and remained almost clear with alkalis, and it made a small ebullition with acids.

Evaporated, a gallon yielded only thirteen grains of sediment: Dr. *Rutty* tells us, that the salt of this water is a calcareous Glauber, because it did not emit an urinous smell with sal ammoniac; but I think the the water's remaining clear with alkalies, makes it doubtful of what nature the salt is.

GERMAN WATERS.

P O L Z I N,

In the province of POMERANIA, in UPPER SAXONY,

Is a sulphureous chalybeate water, which yields an earth of an alkaline nature, by evaporation: we have an indistinct account of it in the *Ephemerides German.* A. N. C. Dec. 2. Ann. 6. obs. 77. And it is likewise mentioned by *D. G. Thebesius*, in the First Volume of the *Nova Acta Physic. medic.* A. N. C. published in the year 1757.

K U P F E R Z E L L,

Situated in the lordship of LANGENBERG,

Is a very clear chalybeate water, full of a mineral spirit, which has a strong sulphureous

reous smell, and not a disagreeable taste, of which we have an account in the Ephemerid. A. N. C. cent. 10. obs. 71.

Evaporated, the sediment seems to be composed of a calcareous earth, and different salts, natron and sea salt, and perhaps a calcareous Glauber salt.

S P A N I S H W A T E R S.

VIANA AND SUIDIS,

In the province of GALLICIA.

Baccius says, there is one cold sulphureous chalybeate water a few miles from the town of Viana, which, when drank, proves diuretic; and another water of the same kind in the mountains of Suidis, in the same province.

C H A P. III.

OF WATERS SAID TO BE IMPREGNATED WITH ARSENIC.

WE mentioned formerly, that perhaps some waters are impregnated with arsenic, as this mineral is said to be sometimes found native in such a state, as to be soluble in water; but luckily we have no certain account of any such having been hitherto discovered; though we are told, in *Varenius's* Geography, vol. i. chap. xvii. prop. 12. page 384. of springs which were formerly said to be poisonous. Such as the fountain of Neptune, near Terracina, in the country of the Volscians; a fountain in Theffaly; several fountains on and about the Alps, that have been filled up with stones, &c.

If it is true that such fountains do exist, it is probable that their waters owe their poisonous quality to arsenic.

CLASS IV.

OF WATERS WHICH HAVE AN
EARTH EITHER SUSPENDED
OR DISSOLVED IN THEM.

THE last class of cold waters, we are to consider, is of those which are impregnated principally with an earthy matter; many of which have been called petrifying, either from their penetrating into the pores of vegetable substances thrown into their basins or channels, and there depositing their earthy matter, so as to fill up the interstices, and make them appear to be entirely made up of an earthy or stony matter; or from their letting fall their earth on such bodies, so as at last to cover them with a stony crust.

As these waters appear quite clear and limpid at their springs, it has been generally believed, that the earths are dissolved, and not suspended in them; and that their solution has been affected by means of an acid, which, being partly in a volatile state,

state, has in part evaporated; after which, the water being no longer capable of suspending such earths, has let them drop on the surface or in the pores of such substances as have been put in their basons or channels.

This is probably the case with many waters, for we find an acid joined either to a calcareous earth or the fossil alkali, in form of a neutral salt, mixed with the earth^a got by evaporating them.

How-

^a Dr. *Short*, in treating of *Knareborough* dropping well, and some of the petrifying waters in *Derbyshire*, after mentioning what is taken notice of by all writers on Mineral Waters, that an earth alone, without a salt, is not sufficient for the forming petrifications; says, that the nitre, i. e. calcareous Glauber, is the salt chiefly met with in petrifying waters, and seems to be the fittest salt for the cementing their earthy particles in the formation of petrifications. See his 1st Vol. Quarto, page 108. However, Dr. *Rutty* mentions some such waters, where a sea salt and not a calcareous Glauber was found mixed with this earth; and it ought to be observed, that these petrifications are of different kinds, according to the nature of the earth that is suspended or dissolved in the water, whether it be chalk, limestone, spar, marble, talc, gypsum, selenite, or any other; and hence we find, that the petrifications have sometimes the colour almost of common earth, but are friable and brittle; and at other times, that they are firmer; that sometimes they are whitish and foliated, or lye in lamina, one above another, while at other times

However, Mr. *Macbride*, in his experimental Effays, Essay v. Experiment 21. seems to think, that the earth is kept dissolved in many waters of this kind, by its having been some how or other deprived of its fixed air, and reduced to a state analagous to that of quicklime, in the bowels of the earth; and that when such waters are exposed to the open air, and their earth fully saturated with air, it then falls to the bottom, the water being no longer a menstruum capable of keeping it dissolved.

Mr. *Macbride* says, we may easily determine whether earth is suspended in water by an acid, or by being deprived of air; for if we take two glass-fulls of the same water, and mix a little of any of the common alkalies in their mild state (when they are fully saturated with air) with the water in one of the glasses, and mix a little of the same sort of alkali, made caustic, or deprived of its air, with the water in the other glass, that then if the earth is suspended in the water

times they are somewhat diaphonous, and appear like a yellowish spar or marble. And we sometimes observe, that the same water produces a variety of petrifications, of which Dr. *Hoffman* gives an example in the *Prudel Spring* at the Caroline Baths in Bohemia.

by means of an acid, the water in both glasses will become turbid, and deposite its earth; but if the earth is dissolved in the water by being deprived of air, the water which is mixed with the common mild alkali, will only become turbid, and let fall its earth; but the water mixed with the caustic alkali will remain clear.

And it is probable, that the earth in many of these waters, is suspended by their containing too large a proportion of fixed air, as the honourable Mr. *Cavendish* mentions in the Philosophical Transactions for the year 1757.

These waters were formerly condemned, as being apt to create the stone; but later experience has shewn, that they have no such effect; and if any of them are impregnated in the manner mentioned by Mr. *Macbride*, they may be found to be good dissolvents of the stone, and useful remedies in gravelish and calculous disorders.

There are a great many springs of this kind in different parts of the world, but we shall at present only mention a few, which are,

ENGLISH.

NEWTON DALE.

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ENGLISH.

NEWTON DALE.

BALL.

KNARESBOROUGH.

SCOTCH.

GLEVELY.

THE CAVE IN FIFE.

IRISH.

LOGGSHINY.

MONAGHAN.

DODER.

HOWTH.

SMITH'S QUARY.]

CHINKWELL.

HERMITAGE.

FRENCH.

BESSE.

DE CHANONAT.

DE VERNET.

DE ST. PARDOUX.

DE TRAULIERE.

DE ST. PARISE.

ITALIAN.

VOLTERRANA.

ENGLISH WATERS.

NEWTON DALE,

In YORKSHIRE, nine miles from WHITBY,

Is a petrifying water, mentioned by Dr. *Short* (vol. i. page 105.) who gives us no particular analysis of it; Dr. *Rutty* says, it is cold, and very astringent, and petrifies every thing in its course.

BALL

BALL OR BANDWELL,

Situated near to HENFIELD, in LINCOLN-
SHIRE,

Is a most pleasant sweet water, which becomes turbid and white with alkalies, and deposites a quantity of white earth ; it turns green with syrúp of violets ; and first white and then green with tincture of galls.

It deposites in its course a black fludge, which, when thrown on the fire, stunk, and burnt with a blue flame.

Dr. *Short* evaporated this water (see vol. i. page 107.) and got a little more than four scruples from a gallon ; of which he says, forty-four grains were a calcareous earth, thirty grains a calcareous Glauber salt, and eight grains a marine salt.

KNARESBOROUGH,

The most noted petrifying spring in YORK-
SHIRE.

Dr. *Short* (vol. i. page 106.) says, is one of the sweetest waters he ever tasted, and
is

is twenty-four grains in a pint heavier than common water.

This water curdles soap ; becomes white, and depofites a fediment with alkalies ; and turns muddy and green with galls.

Dr. *Short* evaporated this water, and got two drachms, one fcruple, eleven $\frac{1}{9}$ grains, or one hundred and fifty-one grains of fediment from a gallon ; of which between ninety-eight and ninety-nine grains were earth ; and a little above fifty-two grains a faline matter, which, by chryftallization, proved to be a true calcareous Glauber falt.

This water has been recommended in old fluxes, in the diabetes, in the flour albus, and uterine hæmorrhages.

It has been drank to two, three, four, five, or more quarts in the day ; but Dr. *Short* thinks, that three half pints of this water, and five of the Ball or Band water, are a fufficient forenoon's dofe.

LLANGYBI,

At the village of LLANGYBI, in CARNARVONSHIRE, in NORTH WALES,

Is a mineral water, which has been long used by the people in its neighbourhood.

Dr. *Linden* says, it has a harsh taste, inclining to bitter, and does not lather with soap.

Oleum tartari per deliquium dropt into it, turns it of a white pearl colour; and on standing, it precipitates a white powder. Syrup of violets renders it of a pale green, which grows deeper on standing; and yet, neither spirits of hartshorn, sugar of lead, nor aquafortis, make any visible alteration; though with oil of vitriol it instantly becomes extremely hot, and globules of air line the sides of the glass; but as the water becomes cold, these globules disappear, and a transparent white sediment is left at the bottom. It does not discolour silver.

A gallon of this water distilled in a glass retort, leaves a sediment of from fifty to sixty grains weight; twelve grains of which
are

are a slimy transparent substance, which burns immediately on its coming near the fire, and emits a suffocating smoke, attended with a sour smell, not unlike that of burning foot, but no kind of salt is found in it. The remainder is an extreme fine white earth, upon which neither the strongest alkalies nor acids have any effect; but it mixes with silver in smelting, and renders it very brittle.

It is to be wished, that these and other experiments were repeated frequently, in order to ascertain the true nature of the impregnating materials.

Dr. *Linden* recommends the use of these waters in disorders of the eyes, in scrophulous cases, in variety of cutaneous eruptions, and in other complaints.

There are many other such waters in England, besides these mentioned; such as the one near Skipton; the one near Castle Howard, &c. but as they are not much used for medicinal purposes, we shall pass them over without further notice.

SCOTCH WATERS,

GLEVELY.

There are likewise several of this kind in Scotland, such as that in Glevely, at a place called Achigniglium, in the county of Ross; where it is alledged that the waters of a rivulet turn holly into a greenish stone; and the water of

THE CAVE IN FIFE,

Situated eight miles from EDINBURGH, on the north Side of the FIRTH of FORTH.

Sir *Robert Sibbald*, in the *Phil. Trans.* (see *Abridgment*, vol. ii. page 325.) says, the top of the Cave is covered with stalagmites a foot deep, and the water which droppeth from it, if it touch the skin, maketh it smart.

IRISH WATERS.

Dr. *Rutty* has mentioned several waters which he found in the country of *Ireland*,
which

which have this property of petrifying vegetable substances thrown into them; but as they are looked upon more as matters of curiosity than applied to medicinal purposes, we shall do little more than name them.

Some he mentions without giving any account of their contents, such as,

Loggshiny, in the county of Dublin.

And at *Tallaghan*, in the city of Monaghan.

Others, he says, contain sea salt besides their earth, such as,

A water on the Banks of the *Doder*.

A gallon of which yielded by evaporation only sixteen grains of a residuum, which seemed to have a mixture of sea salt.

Another at *Howth*, in the county of Dublin.

A gallon of which yielded seventeen grains of sediment, that had a mixture of marine salt.

A third at *Smith's Quarry*, near Dublin.

A gallon of which yielded twenty grains of solid matter by evaporation.

And a fourth at *Chinkwell*, in the county of Dublin.

A gallon of which yielded thirty-two grains of sediment.

Others seem to have had a mixture of a calcareous Glauber salt, such as the water of

Hermitage or *Ballydowd*, in the county of Dublin, which, the Doctor says, approaches in its nature to the *Knareborough* water.

By evaporation, he only got seventeen grains of residuum from a gallon, which was composed of a calcareous earth, and a small portion of a calcareous Glauber salt.

FRENCH WATERS.

The French waters which we shall at present take notice of, are all mentioned by *Du Clos*, in his 7th Class of the Mineral Waters of France; they have all a sub-acid or vinous taste, and therefore differ materially in their nature from the other waters of this Class already mentioned, as they contain a good deal of a mineral spirit,
and

and of a volatile acid, and probably on trial may be found to be useful remedies in many disorders.

D E B E S S E,

Situated in the AUVERGNE, near to MONT
D'OR.

This water when taken up in the spring time, was very limpid, and had a great deal of a vinous taste.

In evaporating, it threw up a small brownish white pellicle, and a greyish powder adhered to the sides of the evaporating glass; and after the operation was finished, there remained a white foliated insipid sediment, which was $\frac{1}{645}$ part of the whole, which is in the proportion of ninety-three $\frac{3}{4}$ grains from a gallon; there was a very small portion of a marine salt in the sediment; and the rest was an earth which partly dissolved in wine vinegar: it became yellow when exposed to heat in a crucible.

The water, very soon after, being exposed to heat, lost its sub-acid vinous taste,
and

472 D E C H A N O N A T.

and when distilled, did not differ from common distilled water.

D E C H A N O N A T,

Situated in the AUVERGNE, near to CLERMONT,

This water was limpid and sub-acid.

In evaporating it at Paris, there appeared a number of flocculi in the water. The sediment which remained was $\frac{1}{1836}$ part of the whole, which is in the proportion of thirty-three $\frac{7}{12}$ grains from the gallon; it was an earth without the least appearance of a mixture of any salt; and it totally dissolved in wine vinegar, and acquired a yellow colour in the fire.

D E V E R N E T,

Situated likewise in the AUVERGNE, near to SENECAIRE.

This water was extremely limpid, and had a sub-acid vinous taste.

In evaporating, it threw up a fattish pellicle, and left a very small quantity of an insipid grey foliated earth, which dissolved
in

DE ST. PARDOUX. 473

in distilled wine vinegar, and became darker in its colour by being exposed to a great heat.

DE ST. PARDOUX.

Situated in the BOURBONNOIS,

When taken up in the spring was sub-acid and vinous; and on evaporation left only a small quantity of earth.

DE TRAULIER,

Situated near to ST. PARDOUX, in the
BOURBONNOIS,

When taken up in the spring had a sub-acid penetrating taste.

In evaporating, besides a pellicle on the surface, there appeared flocculi swimming through it. After all the water was evaporated, there remained a small portion of earth, mixed with a salt of the nature of sea salt, which did not make a solution of an alkaline salt turbid.

D E S T. P A R I S E,

Situatèd in the NIVERNOIS.

This water when taken up in the spring, was limpid, had a sub-acid taste, and impressed a small sense of roughness on the tongue.

In evaporating, a broad white pellicle formed on the surface, and after the evaporation was finished, there was left of sediment $\frac{1}{307}$ part of the whole, which is in the proportion of two hundred $\frac{2}{15}$ grains from the gallon. This sediment proved to be a white foliated earth, without any mixture of salt; and it dissolved in wine vinegar, but was not affected by the fire.

C L E R M O N T,

In the neighbourhood of the city of CLERMONT, in the AUVERGNE,

Mr. *Busching* ^a says, there are wells, where any substance laid in them soon contracts a lapideous crust; but the most re-

^a New System of Geography, English Translation, vol. ii. page 552.

VOLTERRANA. 475

markable of these is, that in the suburb of St. Alliere, which has formed the famous stone bridge mentioned by so many historians.

ITALIAN WATERS.

VOLTERRANA.

Father *Leandro Alberti*, the Bolognese, in his description of Italy, says, there is a fountain near to Volterra or Volterrana, in Tuscany, which in fifteen days covers whatever is put into it with stone.

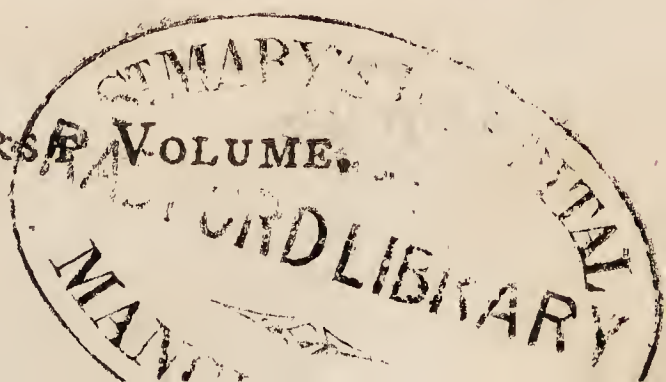
GERMAN WATERS.

PYRMONT,

In a field at the end of the town of PYRMONT, beyond the well where they drink the waters,

Is a spring, the water of which covers the grass, and moss over which it runs, with a brown, light, crumbly, lapideous incrustation.

End of the FIRST VOLUME.



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